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Railway Mechanical Engineer

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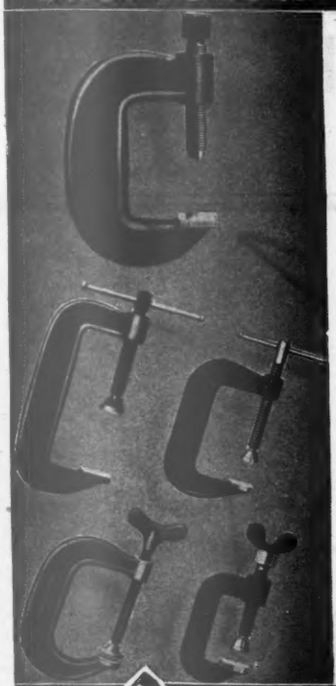

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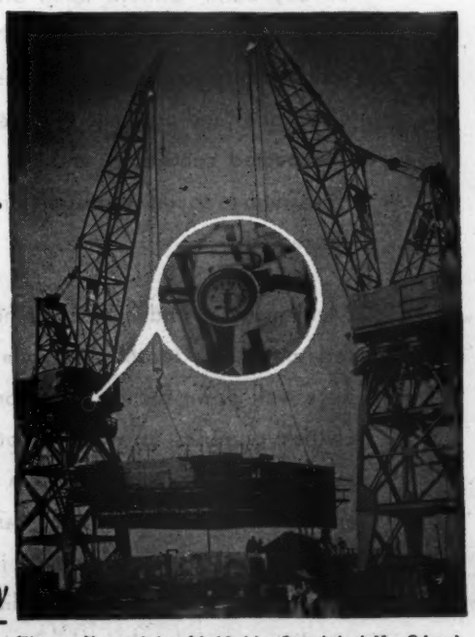

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THE EDITOR'S DESK

MATERIAL SITUATION CHANGING

We are in a period of marked changes in the material situation. During the early part of the war it was necessary to establish and build large camps and training grounds and to build and equip manufacturing plants of all sorts to furnish equipment and supplies for war purposes. With our armed forces spread all over the world it was necessary to assemble vast quantities of materials and equipment to meet any possible emergency on any front. Billions upon billions of dollars were expended in this effort. Now the task is settling down to one of maintaining a steady flow of supplies and equipment, or to meet new and unexpected conditions, and the whole situation is changing, so far as material requirements are concerned.

Many materials and much equipment are available today, not only for those essential projects which were well down on the list of priorities, but for civilian purposes as well. In other words, the material situation is easing up in certain respects and the bottleneck, so far as transportation and industry are concerned today, is largely manpower. With these changing conditions—and they may be more or less kaleidoscopic in the coming months — the railroad mechanical departments must study developments critically and be prepared to act promptly to take advantage of new opportunities. It will require intelligent planning and real strategy to step in and quickly take advantage in the purchase of facilities, materials and equipment which will help to conserve manpower and increase the output per man-hour.

The railroads are being criticized severely in some quarters because they have not taken advantage of these changing situations. The statement has been made that they were not as aggressive as they should be in presenting their claims to the W.P.B. and in insisting upon securing the necessary materials and equipment. It is even said that some of them have not even made requests at Washington for much needed materials. Whether these charges are true or not, it would seem that the time has now come when the railroads, if they are to continue to operate successfully, must be given substantial relief in the way of additional equipment and materials. Even then, the manpower situation is such that these additional facilities must be carefully selected, with a view to conserving manpower and increasing the unit output.

Roy V. Wright

RAILWAY MECHANICAL ENGINEER

(Name Registered, U. S. Patent Office)
With which is incorporated the RAILWAY ELECTRICAL ENGINEER.

Founded in 1832 as the American Rail-Road Journal

DECEMBER, 1943

Volume 117 — *No. 12*

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The Western Maryland was prepared for this oil fire with extinguishing materials and necessary protective clothing for employees

Oil Fire Danger Met by

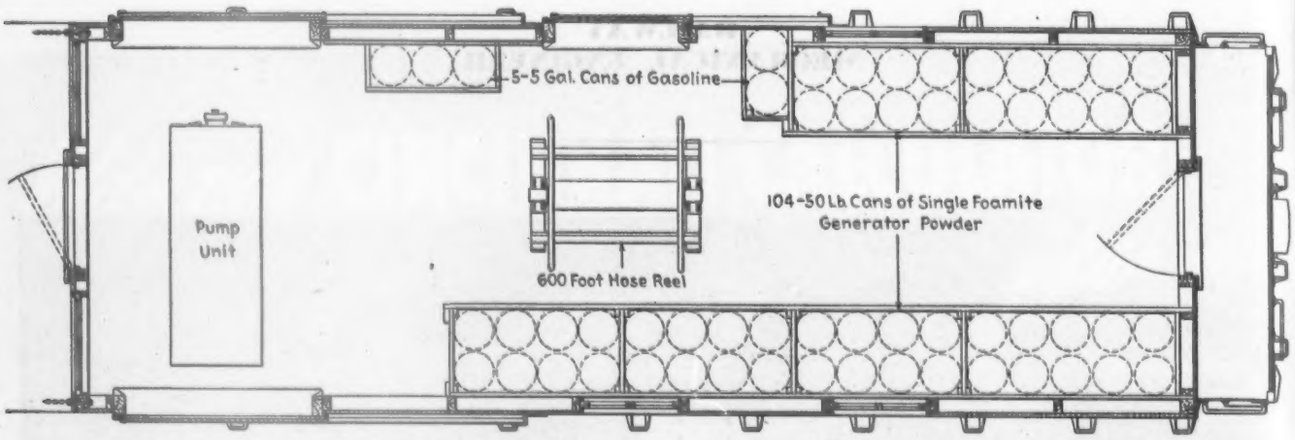
Railroad Fire Fighting Cars

Two extinguishing systems in general use—Equipment design varies—Protection afforded to all property along right of way

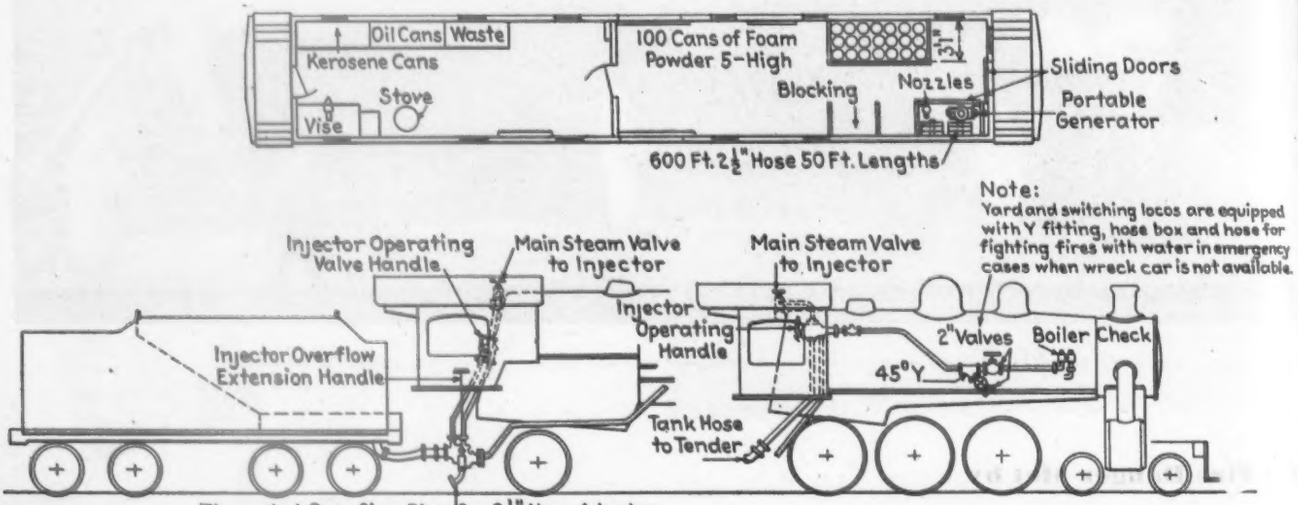
UNPRECEDENTED wartime movements of petroleum products and other combustibles which move in tank cars presented a definite fire hazard which the railroads were compelled to meet. The potential danger in handling tank cars, sometimes in solid trains, at relatively high speeds has been prepared for on most roads by the construction of special fire-fighting cars equipped for use at fires resulting from the carrying of high-volatile gasolines, crudes or other flammable liquids. Some roads which already had fire cars in service added oil-fire-fighting apparatus to their existing equipment until their shops were able to build units intended primarily for use on tank-car fires. Those roads which had not previously used fire cars are now in a position to combat oil fires and at the same time have wreck train equipment for service at fires along the right of way, in car yards or at other points where assistance is not readily available from municipal fire departments or other sources. The cars built or being built by various roads are, therefore, of permanent value in decreasing the likelihood of fire losses in general.

Much thought has been devoted by mechanical department officers to designing and equipping these cars. Numerous factors had to be considered among which were—the volume of tank-car traffic handled, physical characteristics of the right-of-way, availability of materials and supplies, number of units authorized and the choice of the extinguishing method to be employed. Most of the equipment being placed in service makes use of box cars from which a portion of the superstructure is removed and replaced with a tender tank to serve as a source of water supply in localities where no roadside supply is readily available. A variation of this arrangement is the use of a flat car on which a house structure for pumps, generators, tools and supplies and a tender tank are mounted. Some roads which draw their water supplies directly from the tender of service train locomotives use either flat cars or regular wreck train cars to carry supplies and needed auxiliary equipment.

An understanding of the problems involved in fighting



House portion of Pennsylvania fire-fighting car—Racks at the sides hold various size nozzles and connections, suction hose and other equipment



Above: Arrangement of supplies in Lehigh Valley wreck train cars.—Below: Lehigh Valley instructions covering use of injectors to supply water under pressure to the foam generator

tank car fires was necessary to design and equip these cars properly. A common misconception is that the flammable liquids carried in tank cars burn. Actually it is the vapors coming from these liquids which burns; the formation of the vapor depending upon the volatility of the liquid and on the temperature to which it is subjected. Combustion can only be supported in the presence of a sufficient supply of oxygen and, even then, the combination of vapor and oxygen will not burn without a source of initial ignition to start the burning.

The Western Maryland tank car fire well under control

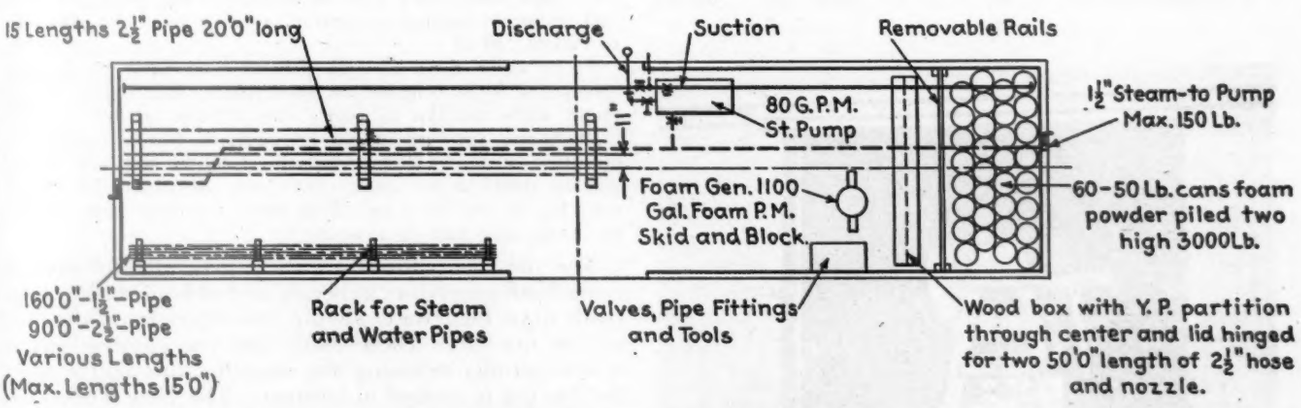
In extinguishing any fire there are four possible methods of procedure; only two of them are likely to be of value in the case of tank-car fires. The four methods are (1) cooling, eliminating the heat required for vaporization and the ignition of the fuel; (2) blanketing, stopping the release of fuel vapor; (3) starving, interrupting the flow of fuel; and (4) diluting, bringing the vapor-air mixture below the combustible limit. The first two are the methods most commonly employed in fighting railroad oil fires. The cooling process is one in which a fine spray of water is directed over the fire area and serves to reduce temperatures to a point where the flammable material will no longer vaporize. This fine mist of water is obtained by utilizing spray or fog nozzles. On oil fires, the spray or fog is more effective than the action of a direct stream from a standard nozzle which, because of its force, tends to spread a fire rather than to cover it with a cooling mist of water. In addition, spray nozzles increase the time that a given supply of water will last about five to one over the requirements of a standard nozzle.

Blanketing depends upon spreading an airfoam of water and chemicals over the fire area. Two methods are generally employed to produce this blanketing foam;

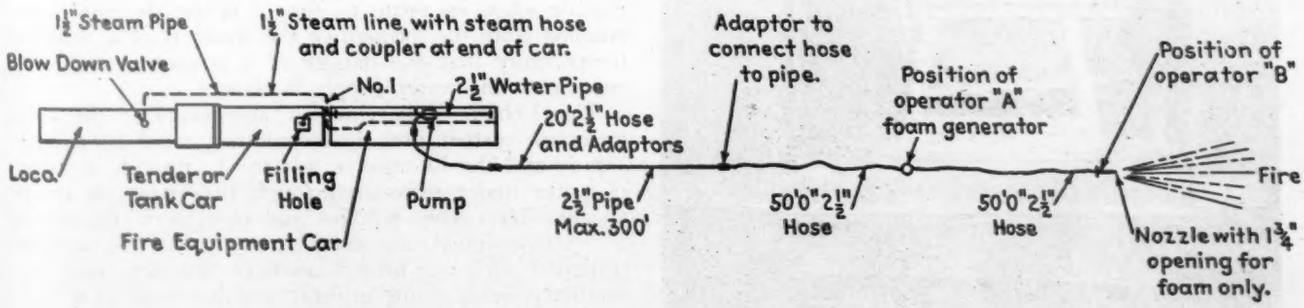
one uses a generator into which a powdered chemical compound is charged to be mixed with water coming from a pump or other pressure source, the foam so created being discharged under pressure at the delivery nozzles; the other utilizes a special mixing nozzle so designed that when operating under pump or other pressure it can be used to draw a liquid foam generating compound through a special flexible connection from a container carried by the man who is handling the nozzle at the scene of a fire. This is accomplished by the design of the delivery outlet which creates a suction on the liquid in the container. Air is also drawn into the line and the action is such that a mixture of water, air and liquid compound forms a foam discharged under pressure at the nozzle tip. Both methods produce a foam which floats on the surface of burning liquids or adheres to surfaces against which it is directed. This serves to exclude air which contains the oxygen required to support combustion. The foam systems also increase the effectiveness of the usually severely limited supply of water which can be carried on a fire-fighting car or drawn from a locomotive tender to an appreciable extent over that obtained from spray or fog nozzles.

Instructions issued to fire crews on the Baltimore & Ohio indicate the procedure generally followed when the foam generator system is employed. The foam generators and powder are supplied by the American-LaFrance-Foamite Corp., Elmira, N. Y. Although the

A demonstration given on the Erie to familiarize supervisors and employees with new fire-fighting facilities

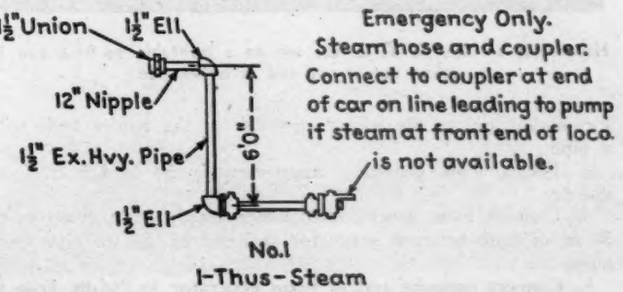

15 Lengths 2½" Pipe 20'0" long
Discharge
Suction
Removable Rails
80 G.P.M. St. Pump
1½" Steam-to Pump Max. 150 Lb.
Foam Gen. 1100 Gal. Foam P.M. Skid and Block.
60-50 Lb. cans foam powder piled two high 3000Lb.
160'0"-1½"-Pipe
90'0"-2½"-Pipe
Various Lengths
(Max. Lengths 15'0")
Rack for Steam and Water Pipes
Valves, Pipe Fittings and Tools
Wood box with Y. P. partition through center and lid hinged for two 50'0" length of 2½" hose and nozzle.

Floor plan of Baltimore & Ohio fire-fighting cars



Piping Arrangement

If loco. is equipped with steam heat hose connect with pump line, otherwise use detail No.1 and connect to line from valve on loco. max. pressure 150 lb.



Emergency Only. Steam hose and coupler. Connect to coupler at end of car on line leading to pump if steam at front end of loco. is not available.

A typical layout illustrating the use of foam fire-fighting equipment as it is employed on the Baltimore & Ohio

The New York Central is installing ten cars of this design—A gas engine-operated pump is installed in the former coal space of the tender

B. & O. uses pipe where other roads depend upon fire hose the sequence of operations is typical:

1—The locomotive and tender with coupled fire fighting car should be located a suitable distance from the fire, up to 450 ft.

2—Connect the pump in the car to the steam supply from the locomotive and to the water supply from the tender tank with a pipe

Hose reels on this N. Y. C. car are on a turntable so hose can be taken out at one end or either side

3—Locate foam generator approximately 50 to 125 ft. from the fire.

4—Connect foam generator to water supply from pump using 50 ft. of hose between generator and end of 2½-in. pipe from pump

5—Connect opposite end of foam generator to 2½-in. hose to which is attached play nozzle

6—Cans of foam powder shall be conveniently located near generator

7—Open water valve between tender tank and pump and place operator in position at play pipe nozzle

8—Open steam valve between locomotive and pump and water will be forced through generator; steam pressure to pump not to exceed 150 lb.

9—As water flows through generator, operator should pour contents of 50 lb. container of foam powder into hopper of generator while operator at nozzle directs foam on fire

10—Water pressure of not less than 50 lb. is required for operation of the generator and the 3,000 lb. of foam powder will be sufficient for about one hour's operation. Use nozzle with 1¾ in. tip for foam on oil fires; for other than oil fires use water only with ¾ in nozzle tip.

The steps as outlined are those generally followed in using foam generators although, as has been shown, some roads draw their water supply from special tanks carried on the fire car. These roads also use gasoline pumps which permits releasing the assisting locomotive after the fire car is spotted in location. The New York Central has an arrangement whereby, during very cold weather, the water in the fire-car cistern is kept warm by steam connections when in the yard and by the locomotive while en route to fires. When the car is uncoupled from the locomotive the water is of a sufficient temperature that the danger of a freeze-up and interruption to the water supply is remote.

The Lehigh Valley, which also employs the foam generator system, uses the locomotive tender for a water supply and the locomotive injector to provide a stream of water under pressure through the generator to the nozzle. Necessary supplies and equipment are carried in cars assigned to wreck trains. On locomotives equipped with non-lifting injectors, the fire hose connection is made at the injector overflow pipe. On locomotives with lifting injectors, that operate with self-closing overflow, the hose connection is made at the delivery pipe by disconnecting the delivery pipe at the boiler check, or to a 45 deg. Y-connection in the branch pipe on locomotives so equipped. Adapters are used to make the connections and the desired pressure of 100 to 120 lb. is obtained by manipulating the injector main steam valve.

The operation of the foam making nozzles using a liquid compound known as Phomaide solution is in use on the New York Central. The nozzles and solution are the products of the Pyrene Manufacturing Co., Newark, N. J. A supply of 8,000 gallons of water is carried

(*Continued on page 584*)

American Car and Foundry Builds

Troop Kitchen Cars

A.A.R. box-car design modified for special use—Convenient facilities speed service of food—The strain on baggage cars relieved

SINCE the beginning of the expansion of the nation's armed forces railroad baggage and express cars have been depended upon by the Army for use as kitchen cars during the mass movement of troops. Regular field equipment was installed in these cars for the use of the mess details, each unit stocking these cars at departure points and removing its equipment at destination. This makeshift arrangement took many cars out of regular service and was, at best, only moderately satisfactory.

The American Car and Foundry Company is now building at its Chicago plant 400 specially designed troop kitchen cars which will be used by the Transportation Corps, Army Service Forces, for troop movements in this country in conjunction with troop sleeping cars or other passenger equipment. The first car completed was exhibited at Washington, D. C., to War Department, Navy, Marine and Coast Guard officers on Tuesday, October 26.

The A. A. R. standard 50 ft. 6 in. box car was adopted as a basic design and modified with details worked out by the offices of the Chief of Transportation and the Quartermaster General. The cars are arranged for later conversion to box cars with 8 ft. side doors or express cars for passenger train service.

The steel framing for the underframe, sides and roof follow very closely corresponding A. A. R. standard box car details. The end framing, which is arranged for the end-door opening, is designed to meet A. A. R. requirements for passenger train equipment. The trucks are of the high-speed built-up type. Clearance dimensions will permit the use of these cars wherever passenger trains are operated. The safety appliances meet all requirements.

The sides, ends and roof are insulated with 1-in. Fiberglas secured in the sides and ends with spot-welded nails. The double wood floor is of tongue-and-groove yellow pine, the bottom course being 1¾ in. laid crosswise and the top course 1⅝ in. laid longitudinally. A ramp of non-skid steel floor plate is provided at each side door to take care of differences in elevation between platform floor levels and the car body floor. The side and end lining is tongue-and-groove $^{25}/_{32}$-in. fir covered with ¼-in. fir plywood, and the headlining is No. 16 gauge steel.

The hinged end doors and the inside sliding side doors are of wood covered with steel sheet and both end and side doors have drop sash with hinged screens. The end door openings are 2 ft. 3 in. wide and the side-door openings are 4 ft. wide by 6 ft. high. A safety bar is provided across each end-door opening pivoted to a bracket on the main body end post. The side-door openings are protected by door guards of standard pipe with a pivoted bottom section of expanded metal. Raising the expanded-metal section provides for loading materials into the car. There are 14 windows having sliding sash arranged to raise and equipped with inside screens

Dimensions and Weight of the Army Kitchen Cars

Length inside, ft.-in.	50.6⅛
Length over buffers coupled, ft.-in.	54.2⅛
Truck centers, ft.-in.	40.8½
Width inside, ft.-in.	9.1½
Height inside at center, ft.-in.	9.$^{15}/_{16}$
Height from rail to top of floor, ft.-in.	3.9⅜
Light weight, lb.	77,500

Troop kitchen car built by the American Car and Foundry Company for the Defense Plant Corporation

Working surfaces are large and plenty of shelf and screened cupboard space is provided

also arranged to raise. Each window has a roller curtain which overlaps the window opening at all edges. Similar curtains are provided at the end- and side-door drop sash. Nine pivoted ventilating sash with flush outside screens are installed in the sides of the car close to the side plate, and 11 galvanized-steel exhaust ventilators are installed on the roof with screened openings outside and registers with adjustable shutters inside.

Heating, Brakes and Lighting

The cars are heated by the Vapor Car Heating Company's system of steam heat, there being four plain pipe coils, one located in each corner of the car equipped with manual steam supply valves. The water supply is furnished from an air-pressure water system with air supplied from the emergency reservoir of the air-brake equipment. A hand-operated air pump is located under the sink for emergency use when the cars are standing without an air connection. Water supplies for the sink and for the shower are separate. Two 200 gal. cold-water tanks and one 40 gal. hot-water tank furnish the sink supply, and one 82 gal. cold-water tank and one 30 gal. hot-water tank are connected to the shower. Water for the shower is heated by a Vapor water heater and for the sink by a similar heater and the water backs of the ranges.

Air-brake equipment, furnished by Westinghouse, is the AB-1-B-10 type having two brake cylinders and two AB valves, each operating the brakes on one truck. Air signal equipment is also included. A hand brake is placed at one end of the car located inside the main body end post which serves to operate brakes on one truck only.

The car is lighted by a battery system using fixtures of the lens type which direct light to the working surfaces. Current is supplied by National Carbon Company's replaceable "Eveready" air cell batteries which provide approximately six volts at the fixtures. Six months is the estimated life of batteries under anticipated normal lighting requirements. There are twelve lighting fixtures arranged on two circuits with snap switches, and, in addition, one night light fixture at each end of the car controlled by pull switches.

Car Interior

The interior equipment is of sturdy construction and arranged for convenient use. It consists of two U. S. Army coal ranges connected in tandem. Each range is equipped with water backs, and the smoke pipes from both ranges are connected to a smokejack of a positive exhaust type. A canopy is installed over the ranges with duct connections to two roof exhaust ventilators. The ranges are located on one side of the car adjacent to the side door opening. A coal box of ½ ton capacity is located opposite the range and has a roof hatch for loading with coal. An expanded-metal bin is installed next to the range for wood. Adjacent to the range is a deep sink of heavy galvanized steel having a center partition with wooden drain boards and a splash back. A single swing faucet is provided for hot and cold water supply. Across the car from the sinks is the cook's work table with shelves and drawers below and shelves above. All shelves are furnished with a marine type railing of ⅜-in. pipe. Across the car from the range a utensil cupboard with sliding doors is located and on the other side of the door opening is a refrigerator of counter height. It has two ice wells of approximately 7½ cu. ft. capacity each, with a food compartment between of approximately 15½ cu. ft. capacity. Next to the refrigerator is the meat-cutting table which is also equipped with drawers and shelves below. Shelving is likewise provided above the refrigerator and meat-cutting table. On the opposite side of the car, adjacent to the door opening, the bread locker with shelves below is located and next to this, toward the end of the car, there is a service table supported on three stout stools when in use and carried in brackets on the side of the

(*Continued on page 584*)

Convenient interior arrangements facilitate the preparation of meals for soldiers—A shower bath for the kitchen crew is on the left at the end of the car

Gas Turbine Locomotives

L. P. Michael,
Chairman

Traveling Engineers' committee, of which L. P. Michael is chairman, reports progress in gas-turbine development—Rolling-ball universal joints for mechanical drive shafts described

In the research which this committee has made on the design and development of a 6,000-hp. locomotive that would come within weight limitations of 430,000 lb. at rail, and which could be built in one unit and carried on two six-wheel trucks with all axles and wheels power driven, it is estimated that it will be necessary to use a *prime mover* of a type that will produce power through rotary instead of reciprocating motion, such as a turbine which produces a constant uniform power torque. The turbine can be operated at a much higher speed in revolutions per minute than the reciprocating type engine and for this reason can be constructed to develop more power per pound of weight than the reciprocating type engine, and therefore, the turbine prime mover can be constructed within required weight limitations.

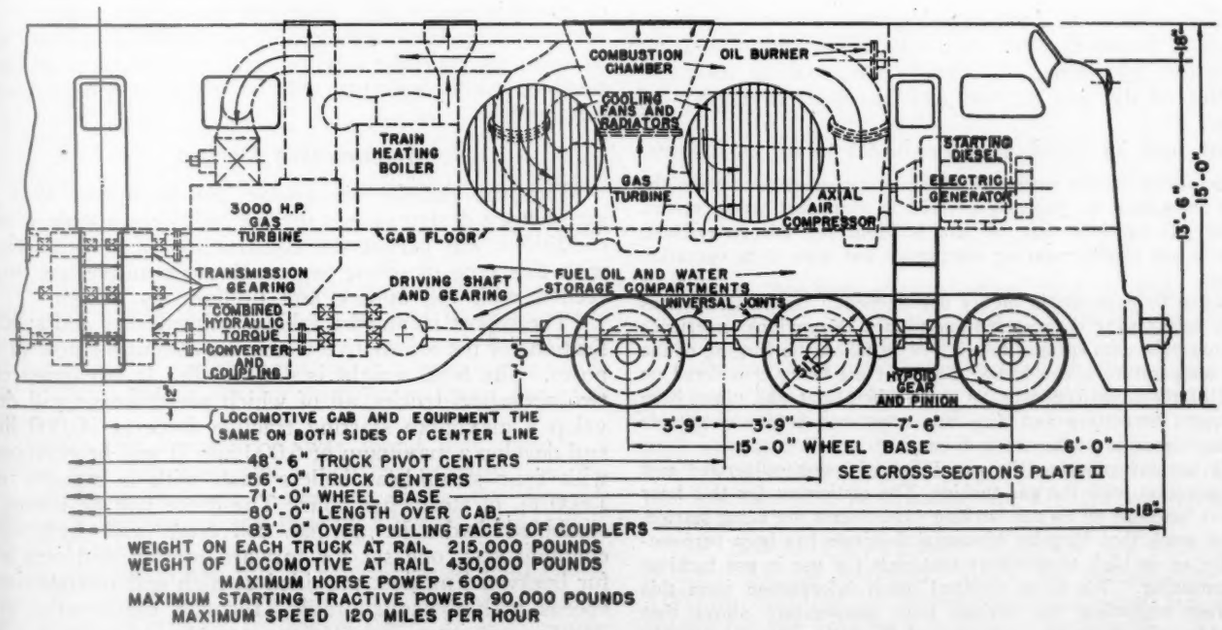
It is also considered necessary to use a *direct mechanical power transmission* instead of an electrical transmission for the reason that the latter, as near as can be estimated, would weigh between twenty and twenty-five per cent more than the mechanical transmission.

The electrical transmission has many desirable features, but it is estimated that the weight, first cost and maintenance cost for the electric generators, controlling equipment and motors, will be considerably greater and the efficiency less than for the direct mechanical transmission, which can be so constructed that it will come within required weight limitations.

In its study of this subject, this committee first considered the use of a steam turbine as a prime mover and spent considerable time and energy developing same. The estimates made, however, indicated that the weight and space required for the high-pressure steam boiler or generator and exhaust-steam condenser would be too great to permit a 6,000-hp. power plant locomotive to be constructed in one unit.

About this time the developments of the gas turbine were so promising, and have continued to be so, that it was considered desirable to plan to use this type of prime mover on the proposed locomotive design.

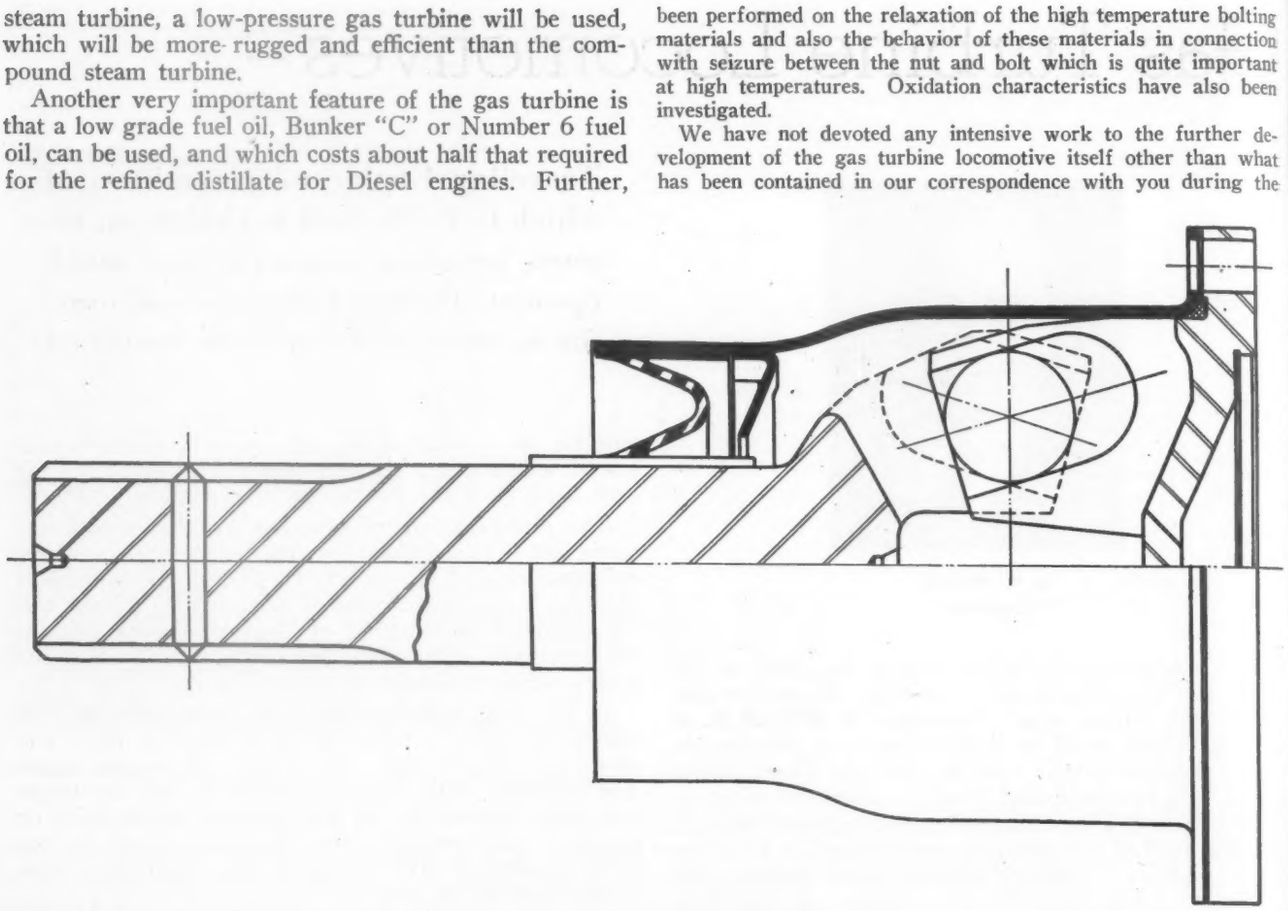
With the use of a gas turbine, the high-pressure steam boiler and the low-pressure exhaust-steam condenser are both eliminated and instead of a high- and low-pressure



Proposed gas-turbine locomotive with hydraulic-mechanical transmission

steam turbine, a low-pressure gas turbine will be used, which will be more rugged and efficient than the compound steam turbine.

Another very important feature of the gas turbine is that a low grade fuel oil, Bunker "C" or Number 6 fuel oil, can be used, and which costs about half that required for the refined distillate for Diesel engines. Further, with the gas turbine no water is required on the locomotive, except that required for generating steam for heating passenger-train cars.



A Bendix-Weiss rolling-ball universal joint designed for a maximum shaft angle of 10 deg. and for plus or minus ½ in. rolling end motion, with flexible dust and lubrication seal

Progress and Developments

War conditions have considerably delayed developments. However, the Allis-Chalmers Manufacturing Company, has been for several years, making intensive studies of the gas turbine and has built a number of them.

On June 24, 1943, their engineers wrote as follows:

The status of this work has advanced considerably beyond the stage mentioned to you and covered in your last year's report.

The gas turbines that we are building for the government projects are rapidly nearing completion but none is in operation as yet.

As can be expected in highly developmental contracts, such as these, delays were encountered due to lack of previous experience in connection with certain items. For instance, the forging of the high temperature alloys in the sizes that are being considered on some of these projects was an undertaking that had never been attempted heretofore and time was consumed before a suitable forging procedure was worked out.

We are investigating the possibility of using pulverized fuel in connection with the gas turbine. The equipment for this later project has been set up and burning experiments are being started.

The work that Battelle Memorial Institute has been performing for us on high temperature materials for use in gas turbines is continuing. We have obtained much information from this program regarding the various high temperature alloys that would be suitable for gas turbines and also information concerning welding and fabrication of such alloys. Additional tests have been performed on the relaxation of the high temperature bolting materials and also the behavior of these materials in connection with seizure between the nut and bolt which is quite important at high temperatures. Oxidation characteristics have also been investigated.

We have not devoted any intensive work to the further development of the gas turbine locomotive itself other than what has been contained in our correspondence with you during the year. However, the above mentioned programs all are associated in detail, if not in the aggregate, with the locomotive unit and the progress being made on these programs is directly applicable to gas turbine locomotives.

The diligent study, research and actual construction of gas turbines by this large manufacturing company is certainly very encouraging, and we therefore believe that as soon as conditions will permit, applications of gas turbines to locomotives will be given serious consideration.

Locomotive Design

With the definite knowledge and assurance that a satisfactory design of gas turbine will be available when conditions will permit the construction of a locomotive with this type of prime mover, this committee has proceeded with the outline and preliminary design.

[The report included a table of dimensions and specifications of the locomotive which the committee now proposes. The total weight is 430,000 lb. It is carried on two six-wheel trucks, all of which are drivers; will develop a maximum starting tractive force at 90,000 lb., and develop a maximum of 6,000 hp. It will be equipped with four steam-heat boilers each with a capacity of 1,600 lb. of steam per hour. The drive will be through combined hydraulic torque converter and hydraulic coupling sets, one set for forward motion and one set for backward motion, provided at high and intermediate speeds with dynamic braking through the reverse hydraulic converter. Each section of the drive shaft will be fitted with two Bendix-Weiss rolling ball universal

joints, one of which in each pair will provide for end motion. The drive will be through hypoid gears and pinions which permit the drive shaft to pass over the axles. Designs of universal joints for the locomotive are being developed by the Bendix Corporation; the hypoid gears by the Gleason Works, Rochester, N. Y.; roller bearings for the axle journals by the Timken Roller Bearing Company, and the combined hydraulic torque converter and coupling sets by the Hydraulic Coupling Division of the American Blower Corporation, Detroit, Mich. Designs for the six-wheel trucks are being developed by the General Steel Castings Corp.—EDITOR.]

Universal Joints for Mechanical Drive

A very important detail of the transmission of power from the gas turbine, to the driving axles and wheels, is the universal joints in the driving shaft. A thorough research was made of the old Cardan two jaw four pin type design of universals, but of the more recent construction with friction, anti-friction and rubber pin bearings. None of these designs, however, seemed to meet all the requirements for heavy duty and comparatively high speed transmission of 3,000 hp. and shaft r. p. m. up to over 1,800 at a maximum speed of 120 m. p. h.

The plain and anti-friction bearings for the pins on these designs would be difficult to lubricate definitely and positively under all conditions and there has been insufficient experience in actual service with rubber universal joints to transmit the horse power and provide the starting torque for the locomotive under consideration.

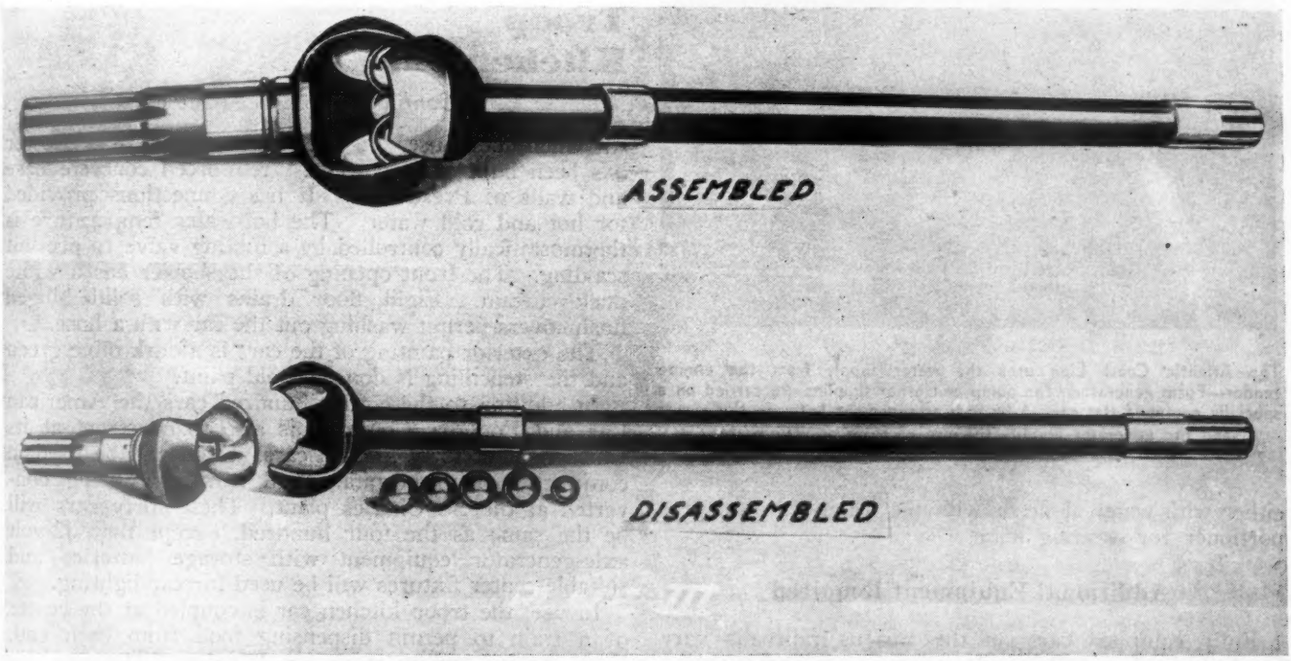
During this research, it was found that there is a rolling ball universal joint which has recently been developed and is being manufactured by the Bendix-Products Division of the Bendix Aviation Corporation, South Bend, Ind.

The Bendix-Weiss rolling ball universal joint is extremely simple and transmits an absolutely uniform velocity from driving to driven shafts at any angular position of one shaft with respect to the other. The ordinary (Cardan) joint does not transmit a uniform velocity from the driving to the driven shaft. There is an acceleration and deceleration of speed twice per revolution, producing for a speed of 3,000 r. p. m., for instance, 12,000 changes in speed per minute in the driven shaft velocity.

The constant velocity feature of the Bendix-Weiss joint is secured by maintaining the plane of driving engagement between the two yokes at half the shaft angle. Steel balls are placed in non-concentric intersecting races cut in the yokes. Without any ball retainer or cage, or other forcible means, the races cause the balls to roll angularly one-half the distance traversed by the yoke.

Another great advantage of the joint lies in its ability to take end motion by allowing the balls to roll endwise in their races thus doing away with slip joints in the driving shafts. The balls roll with a small fraction of the effort required to slide a spline and a difficult place to lubricate is removed.

One railway application of the joint is its use in the streamlined cars (President's Conference street cars) which are in operation in Brooklyn, Pittsburgh, Chicago and elsewhere. Early housing designs for dust and lubrication seals were not durable but a new type has been perfected which on these cars provides for possibly 80,000 to 100,000 miles between inspection and lubrication periods, a medium grease being used in this service where driving shafts are direct connected to 55-hp. motors operating up to 4,200 to 4,500 r. p. m.



A typical Bendix-Weiss universal joint

The simple rugged construction of these universal joints and the exceptional service record they have made, coupled with their long wearing life, low lubrication costs and infrequent inspection requirements, should make them satisfactory for the heavy duty service required in the mechanical transmission for the turbine powered locomotive.

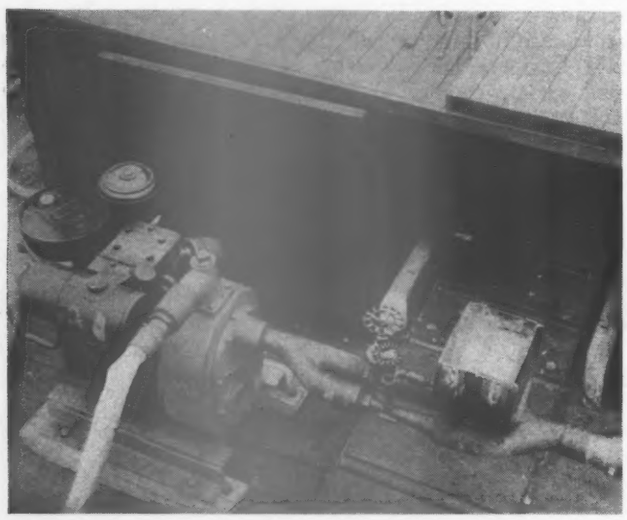
The Bendix Corporation's engineers are developing designs for the universal joints for transmitting the 3,000 hp. required for driving each of the two six-wheel trucks for the proposed 6,000-hp. locomotive.

The report was signed by L. P. Michael (chairman), chief mechanical engineer, C. & N. W.

Railroad Fire-Fighting Cars

(*Continued from page 578*)

on their cars and this amount is sufficient for over 200 minutes with two nozzles in operation. One gallon of the foam liquid with 19 gallons of water yields 350 gallons of foam at the nozzle. The liquid supply is carried in a knapsack over the shoulder of the operator using the playpipe. A variation of this system is used on the Atlantic Coast Line where the same liquid is employed on fire fighting cars. This road uses a proportioner at the pump to create the desired foam which is directed at the fire through a Phomaide playpipe. The A. C. L. uses the assisting locomotive's water supply or any other source which can be reached from the fire-car's location. A simple by-pass permits the pumping unit to be used



The Atlantic Coast Line uses the water supply from the engine tender—Foam generators, the pump and other supplies are carried on a specially equipped flat car—A by-pass arrangement between the pumps and the generator permits the use of foam or plain water

either with water alone or with the water-chemical proportioner for creating foam.

Additional Equipment Required

Fully equipped cars on the various railroads vary but little in their full complement of tools and supplies. Depending upon whether or not any portion of a railroad is electrified specialty tools such as wire cutters may be carried but, in general, the two factors which make for minor variations in equipment are the type of foam producer employed and the source from which pressure is obtained, whether gas or steam engines or direct locomotive connections. Hose is generally carried in 50-ft. lengths with 600 ft. of 2½ in. dia. and 600 ft. 1½ in. dia. considered as an adequate supply of this item. This is supplemented with suction hose which is used where a stream, pond or other open source of water supply can be drawn upon to replenish or supplement that in special tanks or the locomotive tenders. Strainers for use with the suction hose are necessary to insure as clear a supply of water as possible. The fire hose is carried on reels from which it can be run off rapidy; the suction hose is carried on a rack from which it is easily removed. Nozzles of various types, adapters and wrenches of several sizes are required to complete the hose equipment.

Asbestos suits and gloves, fire shields, firemen's helmets, face shields, rubber coats and boots and gas masks are carried for the personal protection of the firefighters. A first aid kit and a special kit for the treatment of burns are considered essential. Fire axes, pike poles, crow bars and claw tools serve many useful purposes and are to be found in most cars. Electric lanterns and floodlights are as important on these cars as they are on regular wreck-train equipment.

Effectiveness in Service

Only one road has reported actual service experience with their fire-fighting equipment. In this instance an oil fire in a car yard was effectively combatted in conjunction with apparatus from a municipal fire department. Other roads have, however, conducted tests to determine the efficiency of their equipment and to train their men in its use. All have reported satisfactory results in combatting fires intended to approximate those it is anticipated may be encountered.

Troop Kitchen Cars

(*Continued from page 580*)

car when out of use. In one corner of the car a shower has been built with a pre-cast reinforced concrete base and walls of Presdwood. It has connections provided for hot and cold water. The hot-water temperature is thermostatically controlled by a mixing valve to prevent scalding. The front opening of the shower has a white duck curtain. Eight floor drains with solid hinged flush covers permit washing out the car with a hose.

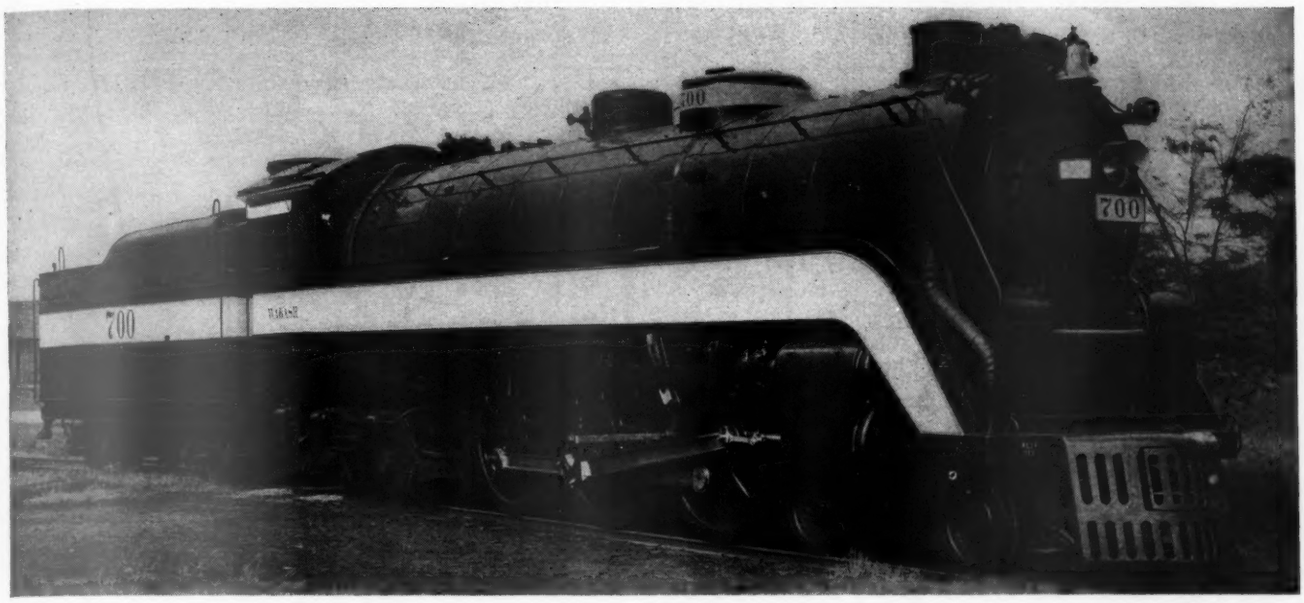
The exterior painting of the cars is a dark olive green and the stencilling is done in gold paint.

In addition to these four hundred cars the American Car and Foundry Company is also to construct at its Chicago plant forty kitchen cars, which will be used in conjunction with hospital ward cars now being converted at the St. Charles plant. These forty cars will be the same as the four hundred, except that 32-volt axle-generator equipment with storage batteries and suitable center fixtures will be used for car lighting.

In use, the troop kitchen car is coupled at the center of a train to permit dispensing food from each end. Each car can furnish meals for 250 men. The cars will be stocked with food, and with kitchen utensils, by unit mess sergeants. Each unit employing the car will provide its own cook and crew. Aside from the cooking utensils, all equipment is stationary.

At mealtimes men are issued paper cups and plates. Bread and cubes of butter are served from paper cartons. The entree is carried in stock pots by two men, with a third following to serve it as the trio proceeds through the train aisles. Coffee and dessert are served in similar fashion. After the meal is finished, a kitchen police crew gathers up every bit of debris, which is burned at the first opportunity.

These cars, which are being built at the rate of 30 per week, will release for commercial service many of the baggage cars which have been in use as make-shift kitchen cars since heavy movements of troops began. Many of these cars will be released in time for the transportation of mail and express during the holiday season.



4-6-4 type passenger-freight locomotive turned out at Decatur shops

Three-Cylinder Power Rebuilt as

Freight-Passenger Locomotives

Wabash converts 2-8-2 locomotives to modern 4-6-4 type for use in high-speed heavy-duty freight or passenger service—Have cast-steel beds

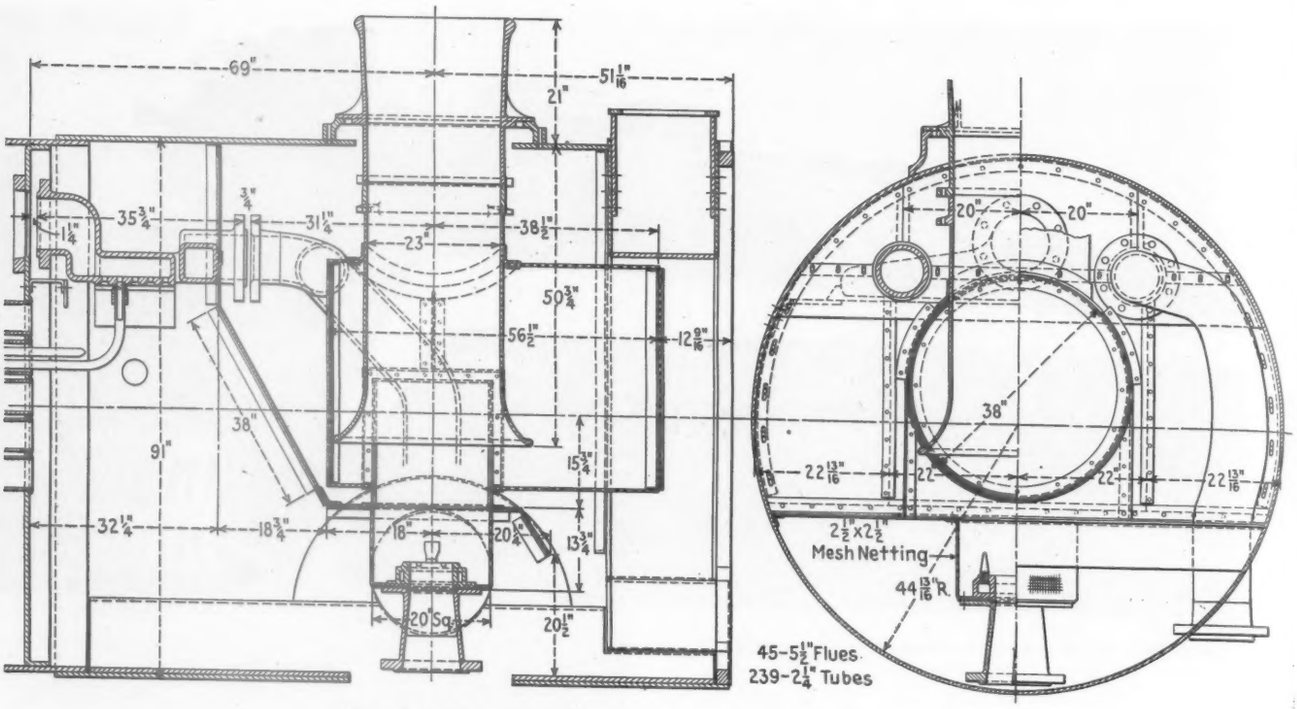
FIVE three-cylinder freight locomotives with a 2-8-2 wheel arrangement built in 1925 for the Wabash by the American Locomotive Company have recently been converted at the railroad's Decatur shops into 4-6-4 type locomotives intended for either heavy fast passenger or fast freight service. These locomotives were a part of an order of 50 built in 1925, 45 of which were of the two-cylinder type, which have gradually been returned to service as general repairs were completed after they had been set aside during the years when traffic demands for heavy freight power were at a minimum. The design of the three-cylinder locomotives was such that they were not adaptable to heavy freight service at the speeds now required and it was, therefore, determined that they should be rebuilt.

The boilers of the five locomotives were in good condition and had a steam capacity 48 per cent greater than that of the existing Wabash class J-1 Pacific-type passenger power. They have 40-in. combustion chambers and are fitted with 45-unit Type A superheaters. New steel locomotive bed castings were ordered and the boilers and cabs applied to them. Other details were also changed and appliances added to complete the modernization and assure economical operation.

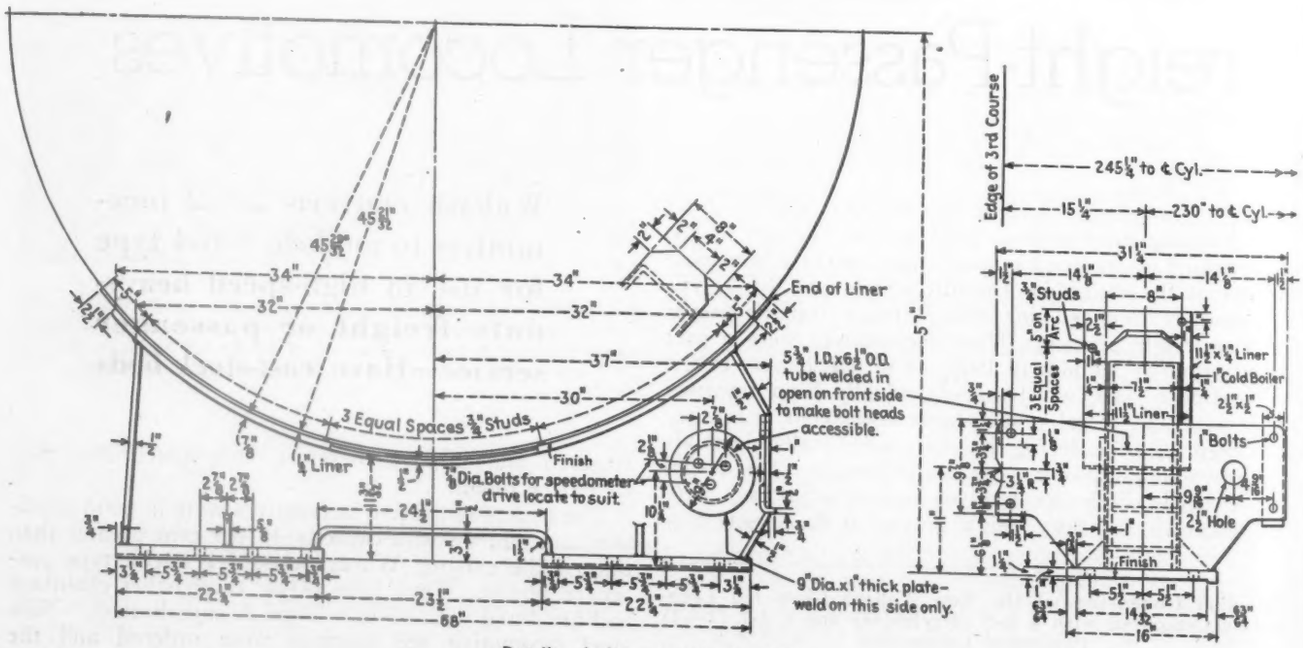
The engine bed has cast integral with it the cylinders and back cylinder heads, with a high cylinder saddle and inside steam pipes, and the main air reservoir. Brackets are cast at the front for the air compressor and feed-water-heater hot-water pump, and there is a bracket cast at the rear on the left side for the application of the stoker engine. The engine truck is of a special cast-steel design with hardened spring-steel pedestal liners and wear plates at the roller centering device. Coil springs are used in the truck to carry 70 per cent of the weight with the other 30 per cent carried by semi-elliptic springs. Trailer-truck brakes are used and the brake cylinders and rigging are accessible from the outside.

Principal Dimensions of the New Wabash Class P-1 Locomotive Compared with a K-5 (3-cylinder) and a J-1 (4-6-2) Passenger Locomotive

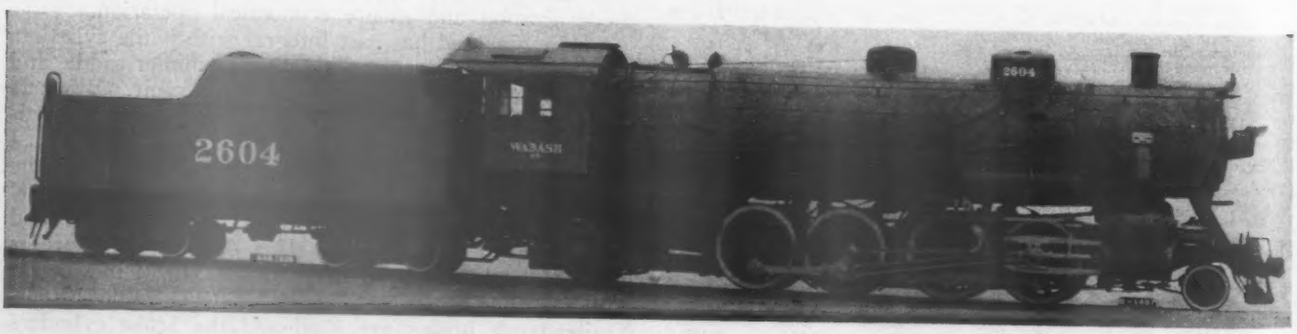
	P-1	K-5	J-1
Type	4-6-4	2-8-2	4-6-2
Boiler pressure, lb.	220	210	215
Cylinders, diameter and stroke, in.	26 x 28	2-23 x 32 1-23 x 28	24 x 26
Diameters of drivers, in.	80	64	74
Tractive force, lb.	44,200	67,869	36,984
Factor of adhesion	4.44	3.76	4.20
Total weight of engine, lb.	374,690	340,490	248,840
Weight of drivers, lb.	196,390	251,215	155,140
Wheel base, engine, ft.-in.	40—7	39—1	34—0
Wheel base, engine and tender, ft.-in.	75—5½	73—9½	66—5⅞
Overall length, ft.-in.	87—5	83—10½	76—7⅝
Tender capacity:			
Coal, tons	16	18	11½
Water, gals.	12,000	10,000	8,800
Boiler dia. 1st. course inside, in.	88	88	68⅝
Firebox length, inside, in.	121⅜	121⅜	108⅛
Firebox width, inside, in.	84¼	84¼	84¼
Grate areas, sq. ft.	70.9	70.9	63
Heating surface, total evaporative, sq. ft.	4,225	4,225	3,310
Heating surface, superheater, sq. ft.	1,051	1,051	740
Heating surface, total equivalent, sq. ft.	5,801	5,801	4,420
Piston valve diameter, in.	12	12	12
Valve travel, in.	8	6½	6½



The front end arrangement is designed to aid in efficient drafting



Details of the waist sheet saddle



Original Wabash K-5 three-cylinder locomotive built in 1925 by the American Locomotive Company

New Materials and Equipment on the P-1 Locomotive Not on the Original K-5 Locomotive

Locomotive bed frame, engine truck, trailer truck, Boxpok driving—wheel centers, swing coupler pilot	General Steel Castings Corporation, Eddystone, Pa.
Roller bearings, all locomotive wheels	Timken Roller Bearing Company, Canton, Ohio
Needle bearings, valve motion	Pilliod Company, New York
Feedwater heater 4½ S.A.	Worthington Pump and Machinery Corporation, Harrison, N. J.
Mechanical lubricators	Detroit Lubricator Company, Detroit, Mich.
Stoker, H.D.	The Standard Stoker Company, Inc., New York
Air brakes, No. 8 ET	Westinghouse Air Brake Company, Wilmerding, Pa.
Radial buffer, Type E2	Franklin Railway Supply Company, Inc., New York
Foameter	Electro-Chemical Engineering Corporation, Chicago
Cylinder protection valves	The Prime Manufacturing Company, Milwaukee, Wis.
Grates, 12-in. Tuyere type	Hulson Grate Company, Keokuk, Ia.
Speed recorder	Chicago Pneumatic Tool Company, Chicago
Cast air radiation elements	Wilson Engineering Corporation, Chicago
Injector, Type S.R.	William Sellers & Co., Inc., Philadelphia, Pa.
Cylinder packing	The Locomotive Finished Material Company, Atchison, Kan.
Driver brake beams—Widdicombe	Sivyer Steel Casting Co., Milwaukee, Wis.

The main wheels are cross-counterbalanced and carry 120 lb. overbalance. The weights of primary and secondary balances were carefully calculated with consideration given to the differing effects of the right and left eccentric rods and cranks. Total overbalance per side is 420 lb. which amounts to 28 per cent of the reciprocating weights. The front and back wheels are statically balanced for rotating weights and each carries 150 lb. overbalance. The dynamic augment at diametral speed of 80 m. p. h. is 5,400 lb. for the main wheels and 6,700 lb. for the front and back wheels.

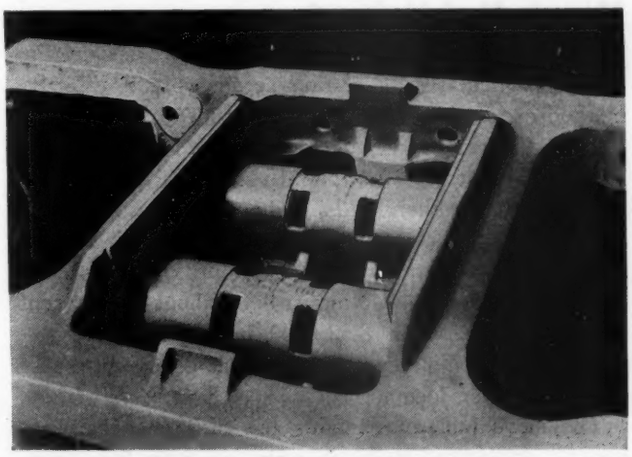
Driving wheels on the rebuilt locomotives are 80 in. in diameter as compared with the 64 in. wheels used formerly and 74 in. for the class J-1 passenger locomotives; tractive force is 44,200 lb., compared with 36,984 lb. for the class J-1. The design of the locomotive permits it to operate on maximum curves of 20 deg., or 288 ft, radius. Roller bearings are used on all drivers and on the engine and trailer trucks.

The Walschaert valve gear is used, with 12-in. piston valves which have 8 in. valve travel, and McGill needle bearings for the link-block, link-trunnion, link-foot and combination-lever bearings. Two 32-pint mechanical lubricators are installed. One furnishes valve oil to the main valves, cylinders, feedwater heater and guides; the other supplies car oil to the truck pedestals, shoe and wedge faces, valvestem crosshead guides, equalizer pins, expansion pads, cylinder center plate, trailer radius-bar center plate and the slide bearing at the back end of each valve-motion radius bar. The multiple bearing crosshead guides are supported from the cross-brace casting instead of from the guide yoke and back cylinder head.

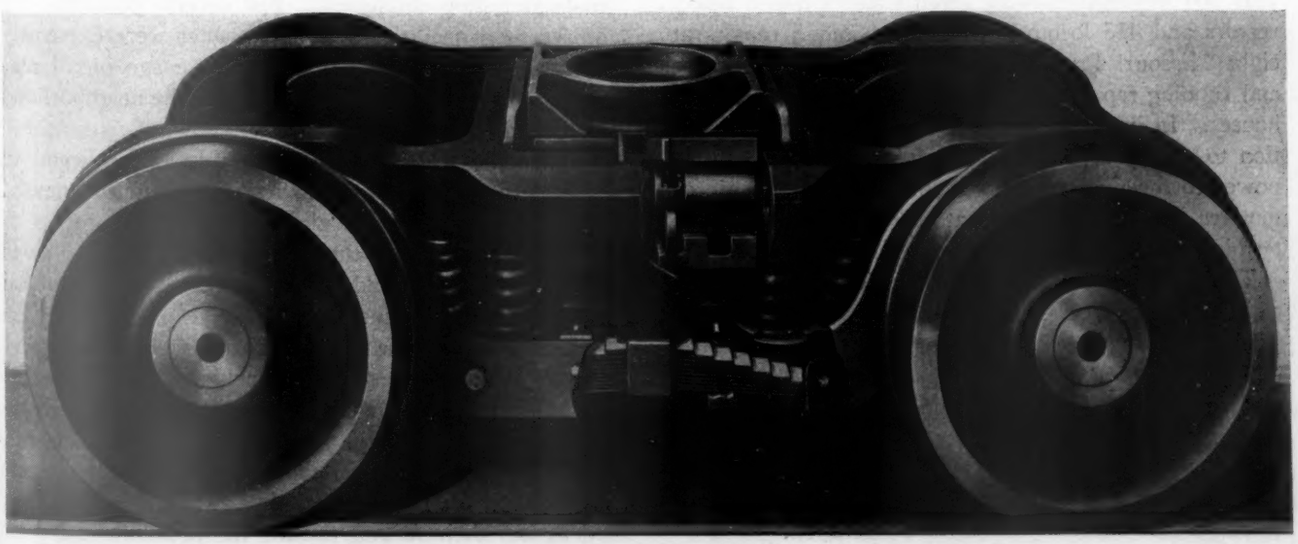
One sliding boiler support is placed between the cylinders and the rear expansion pad. This incorporates box-type welded construction and also serves as a power-reverse-gear bracket and speedometer-drive-wheel bracket. Main and side rods are of alloy steel and were made at the Decatur shops to the railroads design. Valve-motion parts were also made at the shops of low carbon steel. Well-rounded, streamlined steam and exhaust passages are a feature of the design. Exhaust passages average 14 per cent of the cylinder area in all sections between the main valves and the exhaust-stand base. A Master Mechanic's front end with a Goodfellow nozzle and a cylindrical box-type spark arrester is used.

The original tender as used on the three-cylinder type locomotives has been retained but its capacity was increased from 10,000 to 12,000 gal. by adding 16 in. of water space to the top of the tank and removing tool and supply boxes from the front water legs.

As rebuilt the five locomotives become the P-1 class on the Wabash.



Roller centering device of the engine truck



Cast-steel trucks have coil and semi-elliptic springs and a roller centering device

EDITORIALS

What Improvements Can Be Made?

Coupler and draft-gear failures constitute a disturbing cause of delays to freight shipments en route. The railroads are operating today under heavy handicaps. Yet every possible effort must be made to keep the cars and trains on the move. Head work, intelligent planning, and good strategy as to the disposal of available manpower and materials seem to be about the only recourse left. What can be done to insure better inspection and what can be done to keep the couplers and draft gear in prime condition so that they will not fail in service? Your letter must reach our New York office as promptly as possible and not later than December 15.

Maintenance Work Publicized

A news release recently given out by the Missouri Pacific is particularly interesting because of the effective method used to give the public some idea of the magnitude of the job of keeping locomotives in condition to handle heavy traffic on the Missouri Pacific and, by implication, on other roads. The 1,146 steam and 51 Diesel-electric locomotives on the Missouri Pacific, for example, are maintained by approximately 9,000 employees, which is an increase of about 5 per cent over last year, when 8,520,000 man-hours were expended on locomotive maintenance at an average cost of $10,000 per locomotive.

The news bulletin explains the difference between various classes of repairs in order to show how thoroughly organized this work is and explains that last year 304 locomotives were given Class 2 and 3 heavy repairs and 415 locomotives Class 4 and 5 repairs at eight Missouri Pacific shop points, light maintenance and running repairs being made at a total of 41 roundhouses. In handling the latter work, particular attention to speedy repairs and the quick return of motive power to revenue service was said to permit 100 locomotives a day to be turned at each of the two largest terminals of this road.

The bulletin included a general description of the rigid periodic inspections made in accordance with government regulations to assure safety and said that the effectiveness of heavy maintenance and running repair operations on the Missouri Pacific is indicated by the relatively small number of failures in proportion to the total mileage operated, last year, for example, the figures showing 151,000 miles per failure in 50,000,000 miles of locomotive operation.

The Missouri Pacific, in issuing this bulletin of specific factual information about its motive power maintenance and performance, is undoubtedly contributing to increased public appreciation of the magnitude of the maintenance job which railroads ordinarily do with little fuss, and which has become difficult now only because of the current shortages in manpower and materials.

Machinery Needs Can Now Be Filled

The outbreak of the war caught many industries unprepared as far as certain essential materials and supplies were concerned and, in this respect the railroads were no exception, particularly as regards machine tools and shop equipment. For several years the acquisitions of facilities of this character were extremely light with the result that the average age of all machine tools in railroad shops is now in the neighborhood of 25 years.

When the real pressure of wartime traffic began to be experienced by the railways it was, unfortunately, at a time when defense plants were in the process of being equipped and the machine-tool industry was buried under thousands of orders for tools for these plants and foreign customers.

Two years ago the situation in the machine-tool and shop-equipment industry was such that most railroad mechanical men felt that it was simply useless to attempt to buy that type of equipment and when the long-time deliveries of low-priority customers, such as the railroads were at that time, was taken into consideration, their feeling toward the possibility of getting machinery was probably not far wrong.

As the obsolete equipment in most railroad shops began to be put under load it became obvious that certain types of shop equipment would not deliver the output necessary to return motive power to road service in the required time and requests began to be made on machine tool builders for needed equipment. Within the past six to nine months the machine-tool industry has experienced a change and the job of equipping defense plants has been so well done that there is now opportunity to supply customers such as the railroads whose wants have been neglected.

Strange as it may seem, there were those in Washington who were not fully alive to the absolute necessity of seeing that the railroads got needed shop equipment and in all fairness it must be said that this was due in large part to the fact that railroad men themselves did not always bring it to the attention of the right people at the right time.

One of the most encouraging signs of recent weeks is that now, at a time when the machine tool and shop-equipment industry is rapidly finding itself in a more favorable position to take care of the needs of the railroads, there has been a growing appreciation on the part of government agencies of the vital importance of doing everything humanly possible to make sure that there is no failure of rail transportation. In fact, if railroad mechanical people will make known their wants in shop facilities every effort will probably be made to see that the needed equipment is given the most favorable delivery dates possible.

Further Improvements In Passenger-Car Design

Except for the inherent advantage of air transport from the point of view of high speed between terminals and private motor cars for convenient individual travel, the railways have a decided edge over other forms of passenger transportation and will doubtless capitalize these advantages to the full in meeting competition after the war. The indications point to a continuance of efforts, already notably successful, to produce light-weight equipment adapted to high speed-service which assures maximum comfort, convenience, pleasure and safety at low unit cost per passenger.

The amount of new passenger equipment normally required by the railroads in a given period depends upon the volume of traffic to be handled, efficiency of car use and the number of cars already available, as influenced by the preceding excess of new installations over retirements, or the reverse as has been the case on American railroads in recent years. Railroad passenger traffic cannot be expected to remain at its present high level after the war, but the rapidity with which present equipment is being worn out, the high percentage of older out-moded cars now in service and the announced intention of railway executives to make a serious bid for post-war passenger business indicate that several thousand new passenger cars will be ordered and built to meet the requirements of the railroads during the first few years immediately after the conclusion of hostilities.

As regards probable trends in design, further improvements in details and more efficient space utilization are anticipated, with little important reduction in car weights. The basic engineering and fabrication of light-weight car body structures, made of high-strength steels and aluminum, are pretty well developed and no revolutionary changes are in sight. The shell weight of a passenger car is much smaller in proportion to total car weight than commonly supposed and there is little chance for important weight savings except in car accessories, interior equipment, trucks, etc. In connection with the last named, the demand for still greater ease of riding may necessitate adding special equipment to trucks which will tend to offset some of the weight savings which may be effected by refinements in design and the use of stronger structural materials.

One of the achievements of railroads in a time when new passenger equipment could not be acquired, has been the adaptation of older cars by relatively slight changes in interior design to meet special requirements including military purposes. Large numbers of old Pullman cars and railroad parlor cars, for example, have been converted into hospital cars, troop sleepers, coaches, etc. Lounge cars as well as express cars have been rebuilt to give additional diner capacity. The conversion of this equipment, admittedly only a temporary expedient to meet emergency needs, simply serves to emphasize the present deficiency of the present supply of passenger-carrying cars, particularly modern types. Lessons now being learned in the operation and service performance of passenger equipment of all types, including these converted cars, will no doubt serve as a basis to which the design of the passenger cars of the future will have to conform.

Observance of Loading Rules

The Committee on Loading Rules of the Car Department Officers' Association made comparatively few suggestions in this year's report for changes in or additions to the existing rules. In submitting its report, however, it did say that, "We believe that if all concerned will put forth every effort to furnish shippers with advice and instruction, to the end that full compliance with the loading rules will be met, a considerable reduction can be made in the number of loads shopped for adjustment." The statement recognizes indirectly that there are at present too many instances in which loads are being accepted for movement from

shippers' sidings which are not loaded in compliance with the rules. It further recognizes that there might be an excuse for a shipper's lack of understanding of the requirements for safe movement and that the duty of familiarizing them with these requirements rests upon responsible railroad employees.

Within the past several years we have experienced not only a tremendous increase in the volume of freight traffic but also a marked change in the character of much of the material moved. Certainly, landing barges, tanks, artillery pieces, jeeps and other implements of modern warfare were new to railroads and their loading required study. It can be said that the problems met were overcome and, in most instances, manufacturers and representatives of the various branches of the service have cooperated in following safe loading practices. But there have been many instances where, either deliberately or because of misunderstanding, shippers have failed properly to secure open-top loads or to brace house-car loads properly. The failure to provide inside box-car door protection has been especially common.

Once these loads were in possession of the roads with proper billing issued they also became potential sources for sideswipes, wrecks and other accidents, as well as for damage claims. At the very least they were responsible for the loss of many precious man hours required for adjustments or transfers of loads if the condition was discovered before an accident occurred or the lading suffered any damage. It is evident, then, that every improperly loaded car which is accepted for movement represents a prospective out-of-pocket expense to the railroad and a delay to or the possible loss of the shipment itself.

The Committee might have pointed out that the "all concerned" were primarily car-department foremen, supervisors and inspectors. Cooperative agents are helpful but the responsibility for determining a car's fitness for movement rests with the car inspectors. Overworked as they are it is not surprising that some mistakes are made but overwork must not be made the excuse for perpetuating a possible dangerous situation. Education of shippers will certainly help but does not relieve the mechanical department of its responsibility. Then too, the inspector's right to refuse a car for movement can be a valuable, sometimes expensive, educational aid when dealing with recalcitrant shippers.

Traction Motor Maintenance

All Diesel-electric locomotives must meet the same daily, monthly and annual inspection requirements. The facilities for making the inspections and the methods of procedure vary with the locality, the type of locomotives serviced and the opinions and ideas of the men in charge of the work. These differences are not surprising for as one shop operator put it, "A year ago we were green as a gourd."

On the question of general overhaul there is little unanimity of opinion. Some railroads feel that regular general overhaul periods should be established and others plan on keeping locomotives working for indefinite periods at remote points, the necessary replacements being made with new parts or with parts which have been reconditioned in the railroad's or the manufacturer's shop.

Requirements of the traction motors and of other motors and generators on the locomotives have probably received the least attention. This can be ascribed to the fact that Diesel-electric locomotives have not been in service many years; that most roads have had little experience with electric traction motors, and that on switching power which is the most widely used type of Diesel-electric locomotive, the wear and tear on motors is relatively small and they will operate over long periods before major repairs are needed.

The motor repair situation is beginning to overtake some railroads operating road power. Electric motors and generators can be rewound and otherwise overhauled in the railroad shops, in the service shops of the locomotive builders, or in the shop of coil manufacturers. When the railroad does the work, it is customary to purchase ready-made coils. Present difficulties arise from several sources. The number of locomotives is increasing. The age of those in service is such that a considerable percentage of the motors are no longer new. War demands require that all equipment work long hours at or near capacity with the result that service shops which do rewinding are loaded to capacity. It has become necessary for at least one manufacturer to withdraw its offer to recondition Diesel-electric locomotive motors and generators.

Railroads with electrified sections having long experience in reconditioning traction motors and generators have shop facilities of their own. Such railroad shops have been doing as much work as possible and the overflow has gone out to manufacturer's service shops. These shops are now loaded with axle generators and shop motors in addition to traction equipment and there is need for an increase of facilities for doing this work.

Some railroads like to send this work out to service shops which have all the necessary facilities and the "know-how." Others prefer to keep this work as much as possible under their own control. This is particularly true of those having shops at some distance from outside service repair points. But traction-motor repair requires shop equipment not owned by most railroads. In addition to winding stands, baking ovens, dipping tanks, etc., the shop should have a balancing machine, and it may prove desirable to have facilities for seasoning commutators. In nearly all cases it is a growing situation which is going to need some consideration.

With the Car Foremen and Inspectors

Use and Maintenance of

Friction Draft Gears*

By J. M. Hall †

THERE are approximately 1,700,000 serviceable freight cars in the United States today, over 85 per cent of them are equipped with friction draft gears. There are 12 certified friction draft gears for freight cars on the market besides other friction gears intended for special service on locomotives, cabooses, ore cars, and passenger cars. Friction draft gears are used at nearly all couplings to protect train lines and equipment against high stresses which develop in ordinary handling of equipment.

The first draft gears were small springs which were satisfactory until the automatic coupler and air brakes were perfected and steel car construction introduced. Air brakes increased the speed possible in operating trains and larger locomotives made possible the operation of longer trains at higher speeds. These changes developed a need for a draft gear with more capacity and less recoil. It was found impractical to increase the capacity of the spring draft gear so as to have sufficient closing capacity as this would result in entirely too much recoil. A spring will kick back or recoil with practically the same force as is applied to it. A coil spring is satisfactory for cushioning a shock but the question is what to do with the energy after cushioning. The energy of the shocks still remains somewhere in the moving bodies after cushioning if it is not absorbed by some means.

In order to have a device which would offer a high cushioning capacity in closing, together with a kick back or recoil which would be low enough so as to allow smooth air-brake applications, the friction draft gear was designed. The first patent in the friction draft gear class was issued to George Westinghouse, Jr. in 1888. Mr. Westinghouse conceived the need of a friction gear to overcome the recoil of coil springs which caused parting of trains. Friction draft gears of today have a cushioning value of around 450,000 lb. with an absorption of from 75 to 98 per cent.

The Problem of Draft-Gear Travel

The purpose of any draft gear is to cushion, absorb and distribute the force between colliding cars or equalize the speed of moving cars in coupled or uncoupled conditions. The draft-gear travel multiplied by its average resistance is the capacity of the gear which is rated in ft.-lb. The ft.-lb. capacity can also be measured by a drop hammer. Capacity determines the volume of a shock which can be imposed at the coupling without going into over solid blows. The resistance offered by the draft gear at the coupling is the force applied to the car at the coupling. If sufficient shock is applied and the capacity of the draft gear is exceeded, the travel is then limited to the spring of the underframe with a rapid rise in resistance of sill pressure, which, of course, will cause failure if carried beyond the strength of the attachments or underframe.

A short travel with a high resistance has its advantages in some cases while a long travel and a lower resistance also has advantages and disadvantages. Many friction draft gears built with long travels have some advantages; however, experience and evolution over the past 40 years has resulted in a draft gear travel of 2⅝ in. to 2¾ in. It is evident that the longer the draft gear travel, the less will be the required resistance or force required to absorb a shock of the same magnitude. There are, however, many objections to a long travel gear. Car construction, train operations, and capacity have a definite relation to travel.

If a draft gear offers a resistance of over 450,000 lb., it will exceed the strength of the coupler shank, resulting in a shortening of the shank before the gear closure is reached. It is possible to obtain friction draft gears today with 2¾-in. travel which will allow all freight cars to be switched without closing the draft gears or causing damage at speeds up to 5 m. p. h. Exceptions are 90- and 120-ton cars. These cars require a longer draft gear travel if the force on the sills is not to exceed 450,000 lb.

Tests have shown that A. A. R. sills and attachments will start to distort when 555,000 to 600,000 lb. pressure is applied repeatedly. Therefore, if a draft gear is applied which has greater over-solid strength than the sills and attachments, repairs will be confined to coupler, sills and car structure. High over-solid capacity protects the draft gear but not the car. However, present-day car structures will resist many over-solid blows without failure.

There are three ways of cushioning and absorbing the energy of shocks at the coupling of freight cars; through the draft gear, in the car structure, and with the lading and car structure working together. There is no doubt but that the use of the draft gear is the economical way. If you are going to depend on the draft gear and not

* Paper presented before the Eastern Car Foreman's Association of New York on Nov. 12, 1943.

† Vice-president, Cardwell Westinghouse Company, Chicago.

the car structure or its lading you are faced with the necessity of using modern draft gears and draft-gear attachments in fairly good condition.

Good Gears vs. Bad Cars

It is considerably more economical to have draft gears in good condition rather than make repairs to the car structure and pay damage claims. Draft-gear manufacturers have continually improved the materials used in their construction to reduce draft gear maintenance costs. There are many thousands of friction draft gears in extensive service today which have required no maintenance and which will offer maximum car protection for many more years.

If forces high enough to cause failure in the underframe or car structure are reached by impacts above the gear's capacity damage claims will follow. These forces are obtained and cannot be eliminated in ordinary operations and switching speeds if low capacity draft gears are used. There is, however, a value in using a modern friction gear in a coupling with an old or obsolete type of gear. The total force developed at the coupling is the same on each car with, of course, the total available protection reduced at the coupling. In effect the modern friction draft gear offers considerable protection to the car in series at the coupling. Instructions as to maximum switching speeds can be issued, but satisfactory results will not be forthcoming. Cars with a modern draft gear in good condition can be handled up to 5 m. p. h. at impact without damage to the car or lading, while cars with low-capacity obsolete draft gears will develop damage when handled at an impact speed of 2 m. p. h.

No. A. A. R. rules require draft gears to be maintained in capacity. Many of the old cars operated today are equipped with worn and obsolete-type gears and it is a problem to decide whether to replace these gears or maintain them in kind, especially so if the life expectancy of the cars is only a few years. Railroads have changed out a great many obsolete types of gears and draft attachments in past years with a definite proof that a saving results.

Brake equipment on a car is used to develop resistance and absorb the energy of a moving car, that is, to check speed or stop a car. It is necessary to maintain brake equipment in good condition to promote safety and prevent damage to cars, lading and property. The work required to stop a car from 5 m. p. h. is the same whether the work is done by a draft gear or the brake shoes. If the car is stopped by the brake shoes, many feet are required; if stopped by the draft gears, 2¾ in. travel of the gears must handle the same amount of work. No brake action can be had without imposing work on the draft gears, while work may be imposed on the draft gears without using the brakes, as in starting of trains, equalizing speeds of cars, switching, etc.

Draft-Gear Economics

It is reasonable to assume that a large saving can be made by the use of a high capacity draft gear. Modern friction draft gears show a low rate of wear in the gear itself and wear is no longer a major problem. Approximately $7.70 per car per year is spent to maintain air brakes, including the replacement of brake shoes. Air brake equipment is periodically inspected and tested. Without this inspection the cost of repairs per car per year would be greatly increased. Considerably less than this amount is expended on repairing draft gears and attachments. It is not unreasonable to believe that a saving of from $30.00 to $40.00 per car per year is had by modernizing and maintaining friction draft gears. If we use the figure of $100.00 per car per year as an average repair cost and $45.00 as resulting from natural wear and tear, which includes wheels, axles and journal bearings, painting, air brake maintenance, brake shoes, lubrication, car structure and miscellaneous, we have left $55.00 per car per year to cover repairs due to shocks and unnatural wear and tear. A large percentage of this can be saved by using modern draft gears. Special attention is being given to draft-gear repairs today and the saving in repair expense has then been surprising, especially so when periodical repairs were made. Periodical inspections and repairs should be made to draft gears on average cars and made frequently on heavy rigid cars in intensive mileage service.

When periodical repairs are made, draft gears, pockets and attachments should be examined and removed if necessary, then repaired and checked before re-application to the cars. Couplers and draft-gear attachments should be checked and restored to nominal original dimensions. Draft gear manufacturers today will lend all assistance possible in any repair program you may develop.

Future draft gear problems will be solved and suitable gears made available as railroad requirements increase. The saving in car-repair expense has been surprisingly reduced, together with damage claims because of the use of friction draft gears. The A. A. R. draft gear committee is at this time studying draft gear specifications and this work, with cooperation from the manufacturers, will benefit the railroads to a large extent if gears are given reasonable attention after they are placed in service.

Discussion

In the discussion which followed the presentation of Mr. Hall's paper a number of the members present indicated their belief that the excessive slack now permitted in many gears was a matter of serious concern. Mr. Hall stated that the approved type gears would not exceed ½ in. in slack within the gear itself, any additional slack resulting from wear in related parts. This statement would, he said, not be true of obsolete or non-approved gears where the slack in the gear might exceed the figure which he had given.

Other members suggested that the A. A. R. should consider the adoption of a rule requiring periodic dropping and inspection of draft gears. The case of one railroad was cited which followed the practice of dropping gears every 18 months on its own equipment, stenciling the cars with the inspection dates. Although not indicating his opinion of the time interval for such inspections, Mr. Hall agreed that such a practice had merit and served frequently to disclose defects in gears and related parts not readily discovered in ordinary inspection.

The question was raised by a member as to the ease with which wear on gears could be determined on several types of gears. Mr. Hall replied that all certified gears could be measured with accuracy by a workman familiar with their construction. All manufacturers have provided measurement points which can be used to determine wear; loose parts also serve as indicators, he said.

All present were in agreement that the proper maintenance of draft gears and related parts was important in reducing damage to car structures and ladings and very important in its effect on reducing the likelihood of break-in-twos.

Conservation of Journal Bearings*

By R. B. Garren †

Prior to Pearl Harbor, the car department forces of the Illinois Central at Centralia, Ill., in an endeavor to create a better operating condition, started to trim journal brass with a mechanical brass trimmer. At the time, we had no thought in mind directly of conserving brass, our whole thought being to prevent hot boxes. However, as we got into the matter further, we found that this was actually saving brass, especially on system cars which we were repacking. When we found a brass that was run down on the sides far beyond the limits permitted by the rules, we trimmed this brass, returned it to the journal from which it was removed and definite checks showed that we got even better operating conditions than if we had put on a new brass. After we were thoroughly convinced in this regard, we extended it to our program repairs, trimming all brasses that showed the slightest indication of running down in the oil recess. Checks of several hundred cars proved that we were receiving excellent operating results from this method, as well as reducing materially the consumption of new brasses, either relined or new. Our saving on program work has averaged in excess of 30 per cent, which is a real item in a shop where 15 to 18 heavy repair cars are turned out daily.

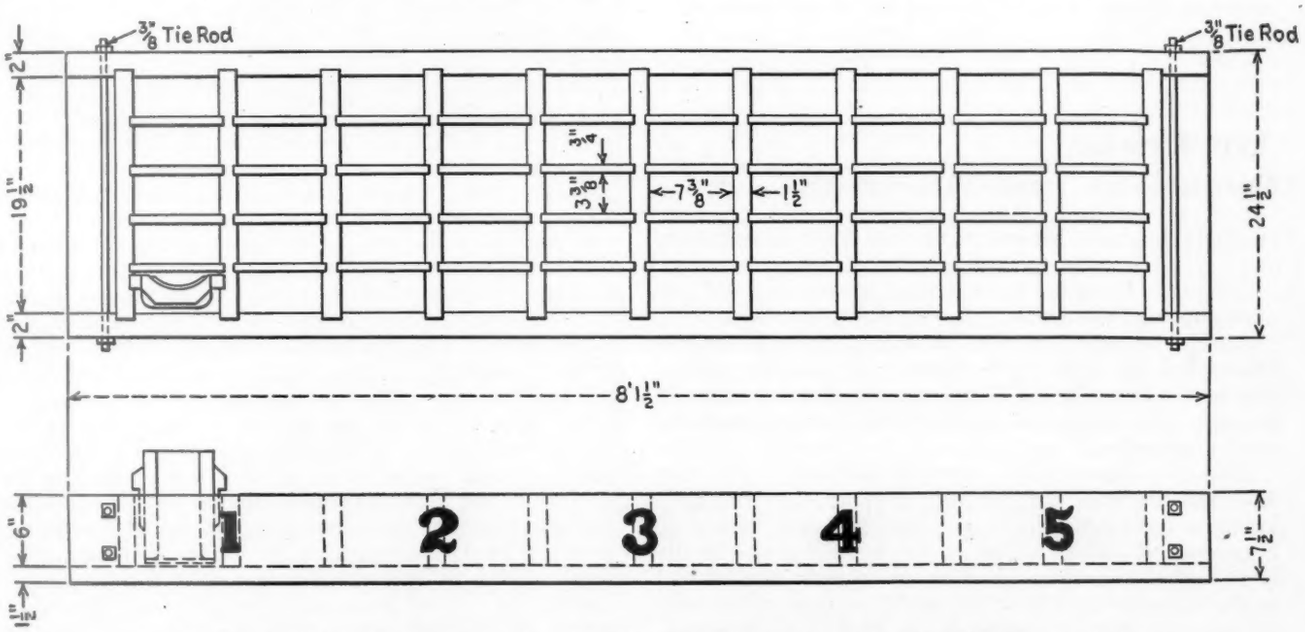
After Pearl Harbor, the whole phase of the brass situation was brought forcibly to our attention by our general officers, through appeals to every man in our employ to study thoroughly all phases of the brass situation, as well as all other vital metals. We secured additional trimmers, intensified our work in this regard and got into the whole matter more thoroughly. The matter of returning the brasses to service which were in good condition and which were removed from condemned wheels was taken up. After several attempts, trials and different methods of properly locating brasses after they were selected, we devised a brass container, made as shown in the drawing.

It consists of a solid, but shallow, lumber box, about 8 ft. long by 2 ft. wide by 7½ in. high, made mostly of 2-in. lumber and divided into 50 sections or slots so proportioned that each slot will accommodate one car brass standing on end. The first two short rows at one end of the box are designated No. 1 and succeeding pairs Nos. 2 to 5, inclusive, as indicated on the drawing, thus making storage space for 10 car brasses in each of five step sizes as shown in the accompanying table.

Step Sizes of Car Brasses for Each Bin Number

Normal capacity, lb.	New, in.	Dimensions of Axle No. 5, in.	No. 4, in.	No. 3, in.	No. 2, in.	No. 1, in.	Worn out, in.
80,000	5	$4^{15}/_{16}$	$4^{14}/_{16}$	$4^{13}/_{16}$	$4^{13}/_{16}$	$4^{11}/_{16}$	4½
100,000	5½	$5^{7}/_{16}$	$5^{6}/_{16}$	$5^{5}/_{16}$	$5^{4}/_{16}$	$5^{3}/_{16}$	5
140,000	6	$5^{15}/_{16}$	$5^{14}/_{16}$	$5^{13}/_{16}$	$5^{12}/_{16}$	$5^{11}/_{16}$	5½

When a pair of wheels is condemned and removed from a car but the brasses are still serviceable, the journal diameter is measured with calipers, the brasses numbered in accordance with the table shown and inserted in the appropriate slots in the brass container where they are kept safely without danger of scoring or damaging the soft metal bearing surfaces until the brasses are needed for re-application to journals of the correct size.



Wooden container with separate slots for 50 individual car brasses, segregated in five different step sizes

Journal bearings are considered condemned when hammer tests show loose or broken lining; when the back or a lug is cracked or broken; when worn ¼ in. or more lengthwise at either end, or when the combined wear lengthwise from such cause is ⅜ in. or more; when the lining is worn through to the brass. When any of these conditions is found the brass is, of course, scrapped and no attempt made to give it a step size and use it again. All brasses are trimmed with a brass trimmer along the bottom edge of each side wall to restore the oil recess before the brasses are placed in service again.

As cars move on through the shop and trucks are dismantled, scrap wheels removed, and axles checked, truckmen before securing a new brass go to the brass container to see if a brass of proper measurement is available, and if so the salvaged brass is used. This

* Short paper presented at the September 21 meeting of the Car Department Association of St. Louis.

† Gang foreman, Illinois Central, Centralia, Ill.

has resulted in a large saving in the consumption of car brasses in our shop and definite checks of their operation have proved that they have given good results with practically no extra expense.

The carman who handles this job must be acquainted with all details and requirements of journal brasses when selecting them for further service. The men who handle the truck position must follow through to see that the brasses are applied to the journals that they are best suitable to operate on. We think enough of this plan that it will be continued after this war emergency and the shortage of critical material is over for the reason that these brasses are already worn in and they fit the journals to which they are applied and, in our experience, we find little or no run down of the metal in the oil recess as we do when new brasses are used.

When I speak of trimming brasses I do not have in mind a carman taking chisel and knocking out the metal that has run down in the oil recess but the placing of the brass in a precision machine built solely for this purpose and which is capable of performing an accurate mechanical job. In our experience, better operating results will be received and the life of journal brass will be materially extended by greater use of the brass trimmers when journal boxes are repacked, it being understood of course that in all cases serviceable brasses are returned to the journals from which they are removed.

Air Brake Questions and Answers

Installation and Maintenance of Axle Generators

227—*Q.—Describe the electric application and the automatic lap position.* A.—Brake pipe exhaust is closed. The drum connects all finger contacts, thereby closing battery wire (*3*) to release wire (*2*) and application wire (*1*). The *21-B* magnets are thereby operated to apply the brakes as described for electro-pneumatic service operation.

228—*Q.—Describe the automatic application position.* A.—This includes the last four notches, the first providing a service rate of brake pipe pressure reduction. Progressively faster reductions are obtained as the handle is moved to the right until an emergency rate is had in the extreme right hand or fourth position. The electric circuits remain connected for the complete movement. The extreme right-hand position should be used at all times for emergency applications for either electro-pneumatic or automatic operation.

229—*Q.—With what is the A locomotive unit equipped?* A.—1—Air compressor, 2—main reservoirs with a 1-in. check value, 3—MS-40 combined automatic and self-lapping brake valve, 4—S-40-C independent brake valve, 5—type *H* filler, 6—E-7-A safety valves, 7—combined equalizing and reduction limiting reservoir, 8—M-3 feed valve, 9—M-3 reducing valve, 10—double heading cut-out cock, 11—electroc-pneumatic master controller, 12—No. 15-C double check valves, 13—No. 21-B magnet bracket, 14—D-22-ER control valve, 15—F-1864 relay valve, 16—combined displacement, auxiliary and emergency reservoir, 17—M-2 brake application valve, 18—"C-2" diaphragm cut-off valve, 19—"C" diaphragm foot valve, 20—½-in. choke fitting, (1/16-in. choke), 21—volume reservoir, 22⅜-in. check valve with choke, 23—B-1 sanding valve, 24—sanding reservoir, 25—⅜-in. check valve, 26—½-in. choke fitting, 27—C-1-20-8 strainer and check valve, 28—⅜in. cut-out cock, 29—F-1 automatic control switch, 30—condenser unit, 31—duplex air gages, 32—single pointer air gage, 33—brake cylinders with slack adjusters, 34—¾-in. by ¾-in. by ⅜-in. cut-out cocks, 35—½-in. ½-in. double cut-out cock, 36—B-3-A conductor's valve, and parts of the conventional train signal system, such as signal valve and whistle, C-1-3-6 strainer and check valve, and car discharge valve.

230—*Q.—Give the duties of these parts.* A.—As is known the purpose of the compressor is to supply compressed air for use with the air brake, alarm whistle, etc. The main reservoirs furnish storage for compressed air to provide an adequate air supply for the operation of the brake. A 1-in. check valve is located between the reservoirs to prevent loss of main reservoir pressure in case of main reservoir connecting pipe leakage. The MS-40 combined automatic and self-lapping brake valve is two distinct brake valves in one housing and operated with one handle over a common quadrant. A manually-operated shifter lever engages the handle shaft of the brake valve to be operated. One brake valve shaft provides electro-pneumatic service operation when the electric braking circuits are operative. The other brake valve shaft provides the conventional pneumatic brake operation for use with the high-speed equipment if, for any reason, the electric braking circuits are inoperative; also when the locomotive is used with standard steam road passenger equipment cars or with freight cars. Handle positions and operation are covered under "Operation of the Equipment." The S-40-C brake valve is a self-lapping type which provides for independent application and release of the locomotive brake. The type "H" filter is for the purpose of protecting the operating devices from dirt, and is located between the main reservoirs and these devices. The E-7-A safety valve limits the main reservoir pressure in event of the governor allowing a higher pressure than intended. There is one of these safety valves located in each compressor discharge pipe. The combined equalizing and reduction limiting reservoir operates with the MS-40 brake valve and the equalizing piston portion of the M-2 brake application valve to control the amount of brake pipe reduction in first service and service positions of the brake valve. The M-3 feed valve, set at 110 lb., regulates the pressure in the brake pipe and supplies air for operating various devices on the locomotive, and the M-3 reducing valve, set at 45 lb. regulates the pressure used for the signal system. The double heading cut-out cock, located beneath the MS-40 brake valve is for the purpose of cutting off the brake valve from the brake pipe and the control pipe in order to transfer control of the brake to another locomotive when assisting as the second locomotive of a double header or helper in the train. The electro-pneumatic master controller is a device which, in conjunction with magnet valves and relay valves installed throughout the train, relays to the brake cylinders the operation of the self-lapping unit of the MS-40 brake valve. One of the No. 15-C double check valves operates to connect the control pipe to the master controller in electro-pneumatic operation, or the emergency reservoir to the master controller in emergency brake application. The other check valve provides connection to the F-1 automatic control switch or similar device to operate the latter from the D-22-ER control valve during an emergency brake application and from the M-2 brake application valve during a safety control brake application. The 21-B magnet valve, as previously described, serves to control the pressure in the straight air pipe.

(*To be continued in a later issue.*)

Portable Scaffold

Typical of the labor-saving devices which may well be found in every progressive railway car shop and car repair point is the portable scaffold illustrated. This is an unusually lightweight, but rigid and strong design, used at the Decatur, Ill., car shops of the Wabash. It

Lightweight portable scaffold which is especially useful in connection with box car work at repair shops and rip tracks

comprises essentially welded tubular steel construction. The two uprights, or end ladders, are 8 ft. high and spaced 7 ft. apart, being tapered by rungs of varying length from about 18 in. at the bottom to 14 in. at the top. The spacing between rungs is also 14 in., so the foot board or platform can be easily placed at any one of six elevations whichever is most convenient for the work being done. Lateral stiffness is secured by welding 2 in. steel diagonal straps to the ladders and to the two horizontal 1¼-in. pipes which serve to space the ladders and extend beyond them, forming handles at a convenient elevation for carrying the scaffold.

Two men can easily move this scaffold any where desired about the car shop or repair tracks and this type of scaffold is of course most useful in connection with box car work.

Decisions of Arbitration Cases

(The Arbitration Committee of the A. A. R. Mechanical Division is called upon to render decisions on a large number of questions and controversies which are submitted from time to time. As these matters are of interest not only to railroad officers but also to car inspectors and others, the Railway Mechanical Engineer will print abstracts of decisions as rendered.)

Proper Terms Must Be Used In Reporting Wheels Scrapped

The Chicago & Eastern Illinois removed a pair of wrought-steel wheels from WCLX car No. 5563, replaced them with new cast-iron wheels and attached a defect card for the wrong repairs, reporting the removed wheels as one second-hand and the other scrap account worn hollow tread, remount gage. The Chicago, Rock Island & Pacific took exception to the charge for the difference in value between one second-hand and one scrap one-wear wrought-steel wheel because Rule 82 does not include one-wear wrought-steel wheels in referring to wheels to be condemned which take the tread-worn-hollow gage for remounting. The C. & E. I. refused to adjust the charge, claiming that its inspector had made an error in reporting and that the wheel was actually condemned because of a high flange.

In a decision rendered November 13, 1942, the Arbitration Committee said: "Billing repair card shows wheel scrapped account worn hollow tread remount gage, which term is not applicable to one-wear wrought-steel wheels. The contention of the Chicago, Rock Island & Pacific Railway is sustained." *Case No. 1794, Chicago & Eastern Illinois versus Chicago, Rock Island & Pacific.*

Disposition Must Be Requested For Usable Second-Hand Material Removed

The Western Maryland applied a new standard A. A. R. riveted wrought coupler yoke to SDRX car 3181 account vertical key slot type non-A.A.R. standard coupler body being defective and rendered a bill in accordance with Rule 101, Item 103. The coupler yoke and key were scrapped, although no defects on these parts were indicated. The parts were not held for owner nor was any disposition requested. The owner demanded second-hand credit under interpretation (C-2) of Rule 17. The Western Maryland disputes the claim on the ground that the rule specifies a "shall" instead of a "must" clause and it is, therefore, not mandatory for the repairing company to request disposition. The railroad stated that it was its general practice to request disposition but that it should not be penalized in this case because it had failed to do so.

In a decision rendered April 22, 1943, the Arbitration Committee sustained the position of the car owner in demanding second-hand credit.—*Case No. 1796, Sinclair Refining Company versus Western Maryland.*

Defect Card Determines Items For Which Billing Will Be Accepted

When repairing SHPX car 9992 the Texas & Pacific applied an L-5 Cardwell side member to a gear composed of L casings and G interior members. Subsequently it issued a defect card covering the replacement of a G-5 side member with the one in question. Later the owner billed the T. & P. for the value of a new gear which was later applied, and also for the labor of application. The Texas & Pacific disclaim responsibility for the material charge. Its contention was that billing could not include anything not covered by the defect card which it issued and that there was no proof that the later renewal of the gear was due to the repairs which it had made. The owner offered in evidence the statement of the gear manufacturer that the substitution made was ruinous for the entire gear and constituted wrong repairs for which the Texas & Pacific should reimburse it when it paid another company for the installation of a complete new gear.

The Arbitration Committee, on April 22, 1943, held that: "If defect card did not specify labor only, car owner may rebill labor and material for only such items as are specified thereon. The contention of car owner is not sustained."—*Case No. 1797, Texas & Pacific versus Shippers' Car Line.*

Material Charges Against "Labor Only" Defect Card Not Upheld

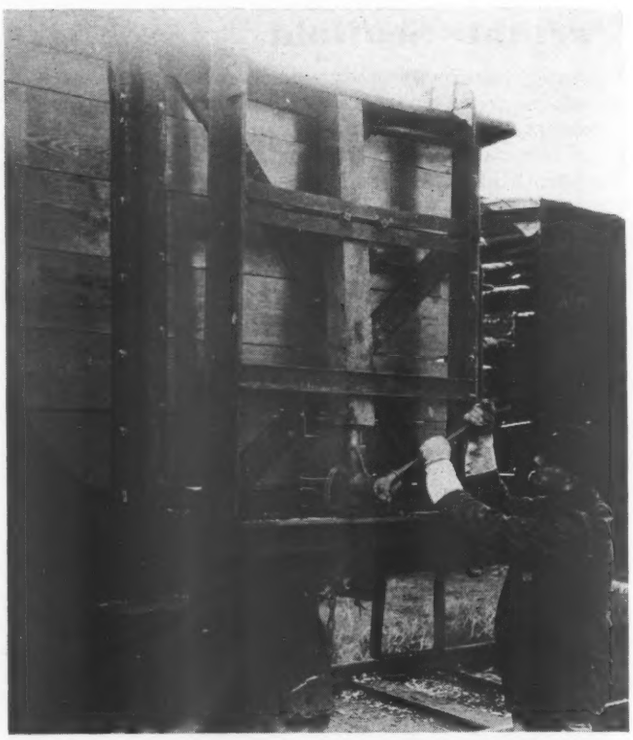
The Atchison, Topeka & Santa Fe removed a defective 20⅛-in. draft gear from PPCX car No. 1061 and substituted a 24⅝-in. gear. It issued a defect card for "labor only" and allowed a scrap credit for the two follower plates which were removed with the defective gear and not required in the application of the 24⅝-in. gear. The car owner corrected the repairs using a gear of the same type that had been removed and made a material charge for two follower plates which were required. The railroad claimed that a charge was not justified for material on a card limited to "labor only." Both parties cited the note following Item 277, Rule 101.

In a decision rendered April 22, 1943, the Arbitration Committee ruled that: "Inasmuch as defect card was properly issued for labor only, the billing should be accordingly. The contention of the Atchison, Topeka & Santa Fe is sustained."—*Case No. 1798, Atchison, Topeka & Santa Fe versus Mather Stock Car Company.*

Bulb Angle Straightener

The top bulb angles of gondolas and hopper cars are frequently bent owing to misuse with car-loading machines. A device which helps in straightening these angles at the Decatur, Ill., shops of the Wabash is illustrated.

As indicated, this consists of two 3-in. by 4-in. side angles, spaced about 54 in. apart, provided with hooks at the upper ends to go over the bulb angle and united at the bottoms with a double angle base which serves to support the journal jack used in applying pressure through a suitable 4-in. square timber to the bent part of the bulb angle. A 3-in. cross channel stiffener is welded between the two side angles, as illustrated, and half-way between that and the top are two cross straps

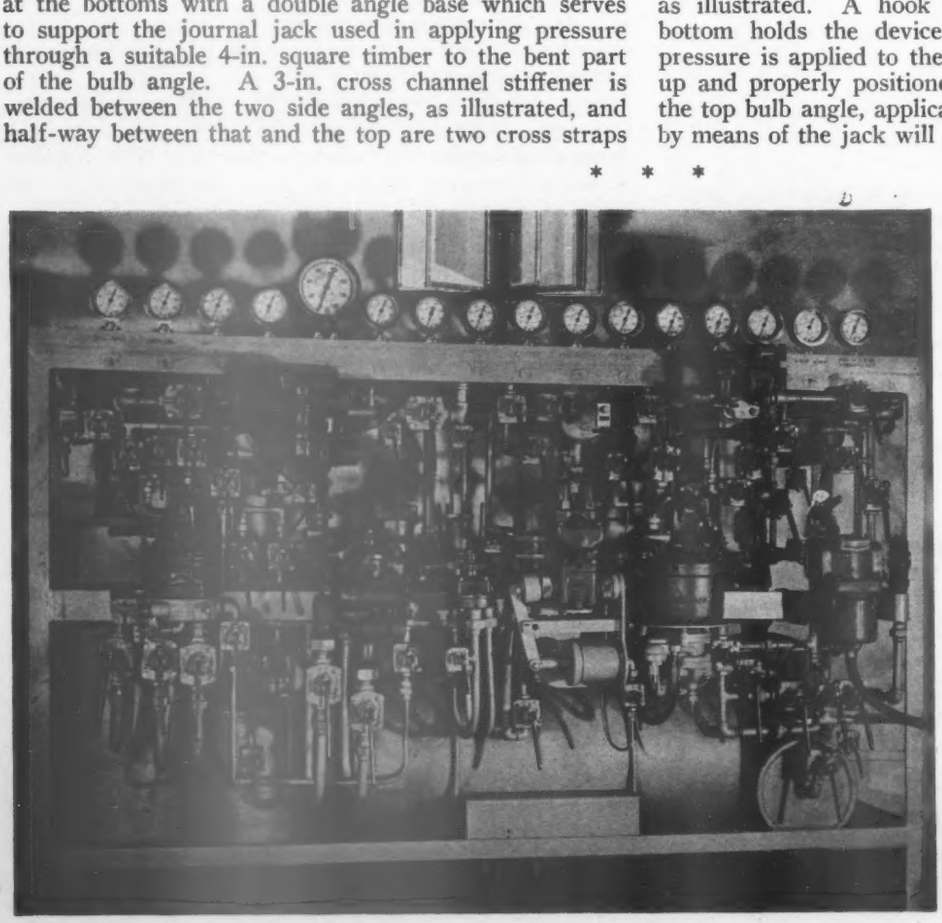


Device for straightening top bulb angles on gondolas and hopper cars

designed to hold the sliding U-bolt which positions the timber at any point between the sides of the device.

The hooks at the top are formed by bending the side angles and applying steel reinforcing plates by welding, as illustrated. A hook and chain attachment at the bottom holds the device against springing out when pressure is applied to the jack. Once this device is set up and properly positioned with respect to the bend in the top bulb angle, application of the necessary pressure by means of the jack will straighten the bulb angle.

* * *



A compact and all-inclusive locomotive air-brake test rack at the Frisco shops, Springfield, Mo.

Elimination of

Cinder Cutting a Big Problem*

E. H. Heidel,
Chairman

CINDER cutting of tubes and flues, continues to be a serious problem on coal-burning railroads, particularly at a time like the present when maximum output is demanded of all locomotives. The committee is unable to report that cinder cutting is completely understood or under control, but feels confident that definite progress is being made toward the eventual reduction or elimination of cinder cutting.

In accordance with established custom, the present committee prepared a questionnaire on cinder cutting designed to bring out certain information with regard to this subject. Replies were received from approximately fifty railroads in all parts of this country and Canada. It is evident that cinder cutting is a problem of considerable importance to practically all coal-burning railroads and has lately become a matter of serious concern due to accidents caused by collapsed flues traceable to excessive cinder cutting.

While the committee does not wish to draw any final conclusions from the replies received, it appears that the master mechanic front end is favored over other types of smokebox arrangements from a cinder cutting standpoint. The same can be said of the Type A superheater. In this connection, however, the committee has tried to bear in mind that large, modern locomotives in heavy, fast service owe a considerable part of their success to the Type E superheater, open-type front ends, syphons, circulators, improved grates, and other devices which make higher coal burning rates possible. A significant number of railroads reported excessive cinder cutting where 3½-in. superheater flues are used. Apparently the trend at present is toward superheater flues of larger diameter. Excessive cinder cutting will certainly not cause the return of smaller power, but will accelerate the study of combustion in the locomotive boiler to the end that improved performance together with a reduction in cinder cutting will result.

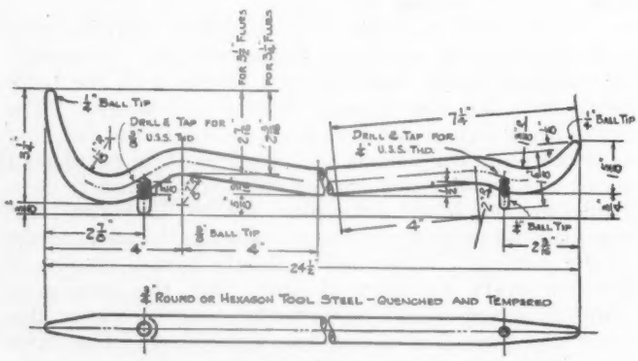
The question of baffle brick has been covered very well in preceding reports to the association. A number of railroads report unsatisfactory results with the baffle brick arch, but one railroad reports as follows: "The baffle brick arch is not a cure all, owing to the fact that it is placed in the firebox as a fixture. The passage of gases and cinders will change their travel, and if these baffles are left in the same place for any length of time, the main accomplishment is a change in location of the cinder cutting. These baffles should have a change of position every so often in order that the cutting or abrasive action would be universal over the entire flue sheet and flues, and not in one fixed place. The baffle brick arch has improved the condition of honey-combing and plugging of flues, and we would not remove them for any price on that account." Unfortunately, cinder breakers or baffles located to protect areas subjected to abnormal cinder cutting, add to gas restrictions and require a higher front end vacuum to support combustion in the higher ranges of firing.

Cinder cutting of tubes and flues is most pronounced at the back end of the tubes, principally adjacent to the prosser recess. This has led to the use by a number of railroads of safe ends of a heavier gage than that of the remainder of the tube. The use of a No. 10 gage safe end on all open flues on mountain type locomotives of one railroad has resulted in the life of the flues being considerably prolonged, and an epidemic of cinder-cut flues at enginehouses between shopping was stopped. This same railroad now proposes a safe end of No. 8 gage thickness for all open flues. While a number of railroads report favorable results with heavy gage safe ends their use is apparently not very widespread, and some roads report an increase in fire cracking of the flue bead when heavy gage safe ends are used. In connection with the question of safe ends, it is thought by some that the prosser mark on the flue has a bad effect due to possible eddy currents set up in the flow of gases, and this matter is being closely watched, as is also the weld between the safe end and flue.

The application of circulators to a firebox is thought by many boiler foremen to reduce cinder cutting. While there has never, apparently, been a specific test conducted to substantiate the reduction in cinder cutting in circulator equipped locomotives, there is evidence that a reduction in cinder cutting exists in locomotives so equipped, in which case the useful life of sheets, tubes and flues is extended. A combination of features embodied in circulators and the circulator arch can theoretically be used to account for good results in the reduction of cinder cutting. The "dutch oven" effect over

* Report on Topic No. 5 prepared for the 1943 year book of the Master Boiler Makers' Association.

the fuel bed as provided by the circulator arch provides an excellent radiating effect upon the fuel bed, and this arch together with the positive mixing action of the circulator cross arms plays an important part in the mixing, retarding and deflecting of cinder cutting combustible particles which otherwise would be drawn unhampered over the ordinary arch directly to the tubes and flues. Another theoretical advantage of circulators in the reduction of cinder cutting is the effect the circulator risers have upon such unconsumed particles as may be drawn from the stoker pot and over the end of the arch. These risers, spaced intermittently above the arch, reduce the cross sectional gas area at each unit and create a pulsating effect sufficient to discourage a concentrated impingement of cinders upon any particular location of sheet, tube, or flue. A reduction of honeycombing and flue plugging is claimed for circulator



Test Bar – Style 1 – For use when inspecting 2¼", 3¼" & 3½" Flues for Cinder Cutting

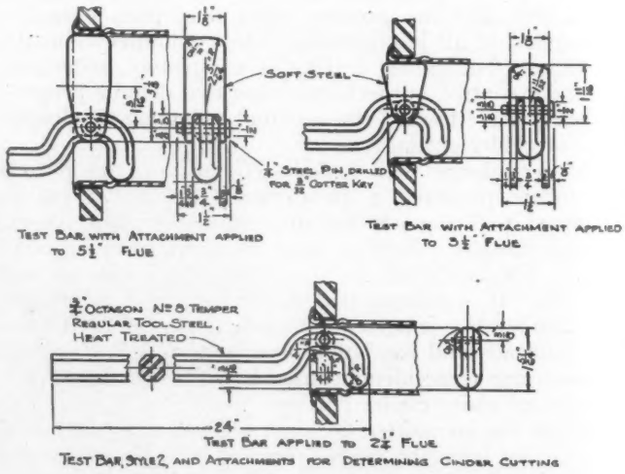
Fig. 1—Test bar for use when inspecting flues for cinder cutting

equipped engines which is a further step in the reduction of cinder wear as clogged flues throw an increased gas velocity through open tubes and flues, and invite concentrated cinder cutting.

Apparently, all coal-burning railroads have cinder cutting to some degree, and this condition is more pronounced in territories burning coals having combustion by-products of highly abrasive characteristics. In such territories, the higher the working rates of the locomotives, the more cinder cutting takes place because of increased gas speeds. One western road reports a decrease in cinder cutting after a reduction in grate air opening, probably due to reduced fuel bed turbulence when the locomotive was working at maximum output. Generally speaking the slowest possible gas speeds attainable which will not only maintain combustion rates, but prevent smoke trailing should be our goal and can be achieved by eliminating all unnecessary restrictions in the exhaust steam passages and in the path of the gases from the fuel bed to the stack. This will result in higher smokebox vacuum per pound of operating back pressure, causing less damage from cinder abrasion for the reason that combustion rates can be maintained at slower gas speeds.

The committee's attention has been directed to two new developments in locomotive drafting designed to effect adequate combustion rates at slower gas speeds. The first of these devices, now being used with uniformly good results on a number of roads in widely separated parts of the country, cannot be described or commented on at length by the committee at this time. Locomotives equipped with these devices are operating successfully with a very appreciably larger nozzle than locomotives of the same class not so equipped in the same service. This is mentioned by the committee in support of the statement made at the beginning of the report that progress is being made toward reduction or elimination of cinder cutting.

The other development is a system of controlled back pressures and draft conditions now in use on a number of Grand Trunk and Canadian National locomotives. The committee on cinder cutting is very much indebted to W. H. Clegg and R. R. McIntosh of the Grand Trunk Western for permission to mention the front end developed under their direction which is doing an outstanding job on a number of locomotives at the present time. This arrangement provides ample draft for both minimum and maximum firing rates by means of a conventional nozzle of rather small cross sectional area but without excessive back pressure, the maximum back pressure being controlled by means of unloading valves located in the exhaust stand exhausting to the atmosphere. This system also limits the front end draft to any predetermined amount based on the resistance through the ash pan, grates, firebed and flues. Due to the consistently clean condition of the fire maintained by the minimum draft carried always exceeding the amount required to overcome resistance to air flow, the total rise in firebed resistance is kept low and the carry-over of large cinders and unburned fuel is reduced to a minimum on account of the resulting low velocity of air flow through the firebed. By means of an air duct leading directly from the atmosphere to the smoke box, the smoke box vacuum is automatically broken whenever the draft exceeds the predetermined amount. The duct at other times is sealed off by a valve disc with seat. This system is entirely independent of any manual operation by the engine crew, and moving parts are kept at a minimum. Through reduction in back pressure a very appreciable improvement in fuel economy is effected,

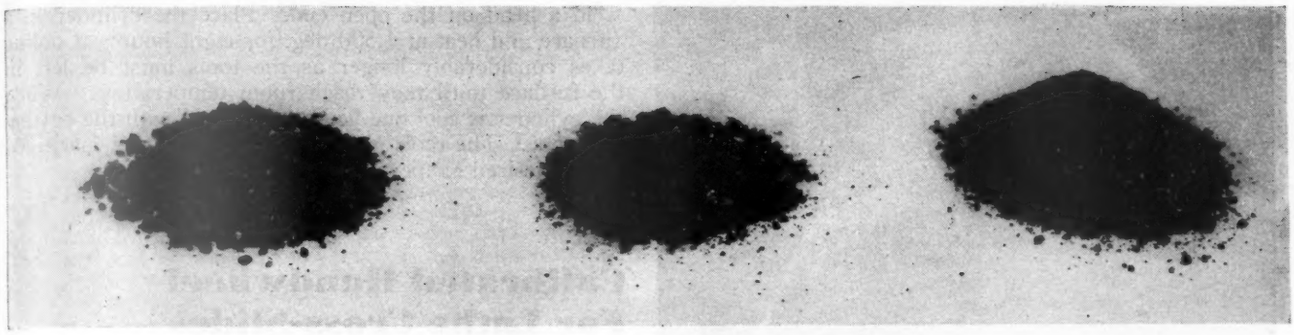

Soft Steel
¼" Steel Pin, Drilled for ⅛" Cotter Key
Test Bar with Attachment Applied to 5½" Flue
Test Bar with Attachment Applied to 3½" Flue
¾" Octagon No. 6 Temper Regular Tool Steel, Heat Treated
24"
Test Bar Applied to 2¼" Flue

Test Bar, Style 2, and Attachments for Determining Cinder Cutting

Fig. 2—Various attachments make this test bar useful on several sizes of flues

and cinder cutting is practically eliminated. This front end arrangement is held in high regard by enginemen, and it is significant that these locomotives are operated in Michigan and in Canada with no front end netting whatever.

The committee has attempted to determine variations in the abrasiveness of various front end cinders, but without much success. The analysis of Franklin County, Ill., coal, stack cinders, and ash is shown in the table. Due to lack of knowledge as to the condition of the cinders at the time they are passing through the flues,



Cinders removed from locomotive front ends in various parts of the country differ considerable in size and abrasive qualities

it is difficult to compare the abrasiveness of the cinders taken from various front ends. A photograph showing cinders removed from locomotive front ends in widely separated parts of the country is shown, the weight of cinders in each pile being the same. The cinders in the pile on the right-hand side were removed from the Grand Trunk locomotive mentioned above.

The number of cases of collapsed flues experienced recently makes it very desirable to subject all flues suspected of excessive cinder cutting to a periodic examination with a test bar. Typical test bars are shown in Figs. 1 and 2. The committee respectfully directs attention to the recommendation of the Bureau of Locomotive Inspection as follows: "It is recommended that the railroad take immediate steps to have all flues that are subject to excessive cinder cutting tested by means of the test bar at regular and frequent intervals; that such flues be removed without delay whenever any indication of undue thinning becomes apparent, that all flues be bored or blown out sufficiently often to prevent accumulations of cinders with consequent impairment or stoppage of draft there through, and that such other means as may be found practical to equalize, so far as possible, the velocity of the products of combustion through the flues be applied to all boilers."

The committee feels that definite progress is being made toward reducing or eliminating cinder cutting of tubes and flues, but that the subject warrants a great deal of further study. It is hoped that the foregoing report will lead to a general discussion of cinder cutting.

Analysis of Franklin County, Ill. Coal

Coal Analysis

Kind of coal	Fixed carbon	Volatile	Moisture	Ash	Sulphur	B. t. u.
Mine run	47.85	34.51	8.01	9.89	0.95	11,935
Nut	48.16	34.30	8.93	8.61	0.88	11,944
Egg	48.91	34.39	8.77	7.93	0.90	12,089
Lump	47.67	34.47	9.01	8.85	0.82	11,874

Analysis of Stack Cinders

Kind of coal	Fixed carbon	Volatile	Moisture	Ash
Mine run	73.51	3.45	0.29	22.75
Nut	73.37	2.27	0.09	24.26
Egg	74.53	2.67	0.11	22.69
Lump	72.44	2.80	0.22	24.55

Analysis of Ash

Kind of coal	Fixed carbon	Volatile	Moisture	Ash
Mine run	25.88	2.93	0.63	70.55
Nut	21.88	1.59	0.65	73.37
Egg	27.40	1.86	0.18	74.53
Lump	28.39	1.89	2.19	72.44

Typical Limits of the Constituents of Ash

Silica, per cent	40 to 60
Alumina, per cent	20 to 35
Ferric oxide	1 to 20
Magnesia, per cent	0.5 to 4
Lime, per cent	1.0 to 15

The report was signed by E. H. Heidel (chairman), general boiler foreman, C. M. St. P. & P.; C. A. Harper (vice-chairman), general boiler inspector, C. C. C. & St. L.; A. T. Hunter, assistant general boiler inspector, A. T. & S. F.; S. A. Fegan, district boiler inspector, Can. Nat., and A. D. O'Neil, chief boiler inspector, Pere Marquette.

Questions and Answers On Welding Practices

(The material in this department is for the assistance of those who are interested in, or wish help on problems relating to welding practices as applied to locomotive and car maintenance. The department is open to any person who cares to submit problems for solution. All communications should bear the name and address of the writer, whose identity will not be disclosed when request is made to that effect.)

Cutting Tubing With a Blowpipe

Q.—I often notice superheater flue ends and pieces of pipe that have been cut with the oxyacetylene blowpipe on which the ends are free from slag accumulation. However, when I cut pipe or flues there is so much slag in the pipe or flue that I have to grind it away to prepare for welding. Am I doing something wrong that can be corrected?

A.—The accumulation of slag on the inside of the pipe or flue is caused from the position of the blowpipe when cutting. In other words, you are cutting pipe in the same manner you would cut plate or bar stock. To get a good clean cut free from slag, hold the blowpipe so that the slag will be blown out of the cut and not through it. As the cut reaches the bottom move the blowpipe along and repeat this operation all the way around the pipe or flue. Using the blowpipe in this manner it is much easier to keep the cut straight and clean with a resulting surface free from slag which has a slight angle just right for welding.

Plugging Holes in Cast-Iron Cylinders

Q.—Several times in recent months we have applied second-hand half cylinder saddles. Usually the frame bolt holes in the second-hand half are so large that to ream the frame holes to that size would nearly ruin the frame. We have attempted to drive steel plugs into these oversize holes and then braze them in but each time the bronze cracks and the plugs turn when the holes are reamed. Can these plugs be applied so that they will stay in place?

A.—To braze steel plugs in frame bolt holes in a cast-iron cylinder requires a little preparation. If the holes are rusty or cut out of round ream them so that the plug will be a tight fit. Chip a 45-deg. angle ½ in.

Oversize holes in cast-iron cylinders can be filled with steel plugs brazed in place

deep around the ends of the bolt holes. Drive the plugs solidly leaving them ½ in. short on one end. Braze about one fourth of the plug to the cylinder and while hot peen vigorously. Repeat the operation peening each quarter until the cavity is filled just flush. When the piece has cooled, chip and grind it. Plugs applied in this manner will not loosen when reaming.

Welded Cylinders For Annealing Tools

Q.—Can the contour tools used to form the flange of driving wheels be annealed so that they can be remachined?

A.—Driving-wheel lathe flange-forming tools offer quite a problem in annealing. However, with proper preparation they can be annealed. First weld a head of ¼-in. plate on some sort of a cylinder, a piece of 6-in. or 8-in. pipe serves nicely. Pack the wornout tools

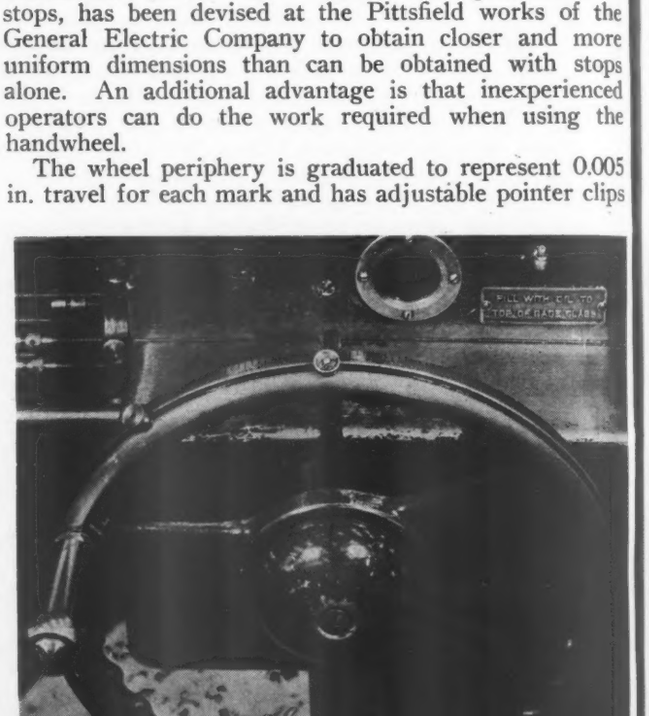
Welded cylinder in which tools packed in charcoal are placed in an annealing furnace

into the cylinder with fine charcoal taking every precaution to keep the tools separated from one another with charcoal. When the cylinder is packed full, arc weld a head on the open end. Place the cylinder in a furnace and heat at 1,500 deg. for eight hours. Cooling takes considerably longer as the tools must be left in the furnace until they reach room temperature. When the cylinder is cool one head is removed with the cutting blowpipe. The tools may now be laid out and machined to the desired shape.

Calibrated Handwheel For Lathe Cross-Slides

A calibrated handwheel for turret lathe cross-slide longitudinal travel, used with or without the regular machine stops, has been devised at the Pittsfield works of the General Electric Company to obtain closer and more uniform dimensions than can be obtained with stops alone. An additional advantage is that inexperienced operators can do the work required when using the handwheel.

The wheel periphery is graduated to represent 0.005 in. travel for each mark and has adjustable pointer clips



Calibration of the handwheel aids in working to close dimensions by inexperienced operators

which slide in a "T" slot in the outer edge of the wheel. The outside diameter is turned flat before being graduated and when the handle is removed from the wheel the slot is machined for the pointer clip bolts to slide in easily.

An opening through which the "T" head bolts may enter the groove is provided at the point where the handle bolts to the wheel. When the handle is in place, the bolts are prevented from leaving the slot. Thumb nuts for the "T" bolts, which can be easily adjusted, hold the pointer clips in place. A reference pointer is formed by a bracket which extends from the wheel hub housing.

When the handwheel is used with a stop, the stop is permitted to kick off the feed before the full travel and the cut is completed by turning the proper pointed clips up to the reference pointer. Uniform dimensions to within 0.001 in.-0.0015 in. are obtained by the use of this method.

Locomotive Boiler Questions and Answers

By George M. Davies

(This department is for the help of those who desire assistance on locomotive boiler problems. Inquiries should bear the name and address of the writer. Anonymous communications will not be considered. The identity of the writer, however, will not be disclosed unless special permission is given to do so. Our readers in the boiler shop are invited to submit their problems for solution.)

Are Staybolts Considered As Heating Surfaces?

Q.—In order to obtain accurate results in calculating locomotive boiler heating surface should the area of the staybolt heads be deducted?—W. H. P.

A.—The following rule is commonly used for computing the heating surface of a locomotive type boiler:

1.—Tubes and flues. Use wetted (outside) surface, between the tube sheets.

2.—Arch Tubes. Use wetted (inside) surface, length measured on the center line between sheets.

3.—Firebox. Use wetted (outside) surface from top of the firebox ring. Deduct the firedoor hole and tube and flue holes.

It will be noticed that in item 3, no mention is made of deducting the area of the staybolts. I do not believe it would be correct to deduct this area, for, while the staybolts would not conduct the heat as rapidly as the firebox sheet itself, they cannot be considered as non-conductive and, therefore, some of the heat of the staybolt is carried to the water surrounding the staybolt and can be considered heating surface.

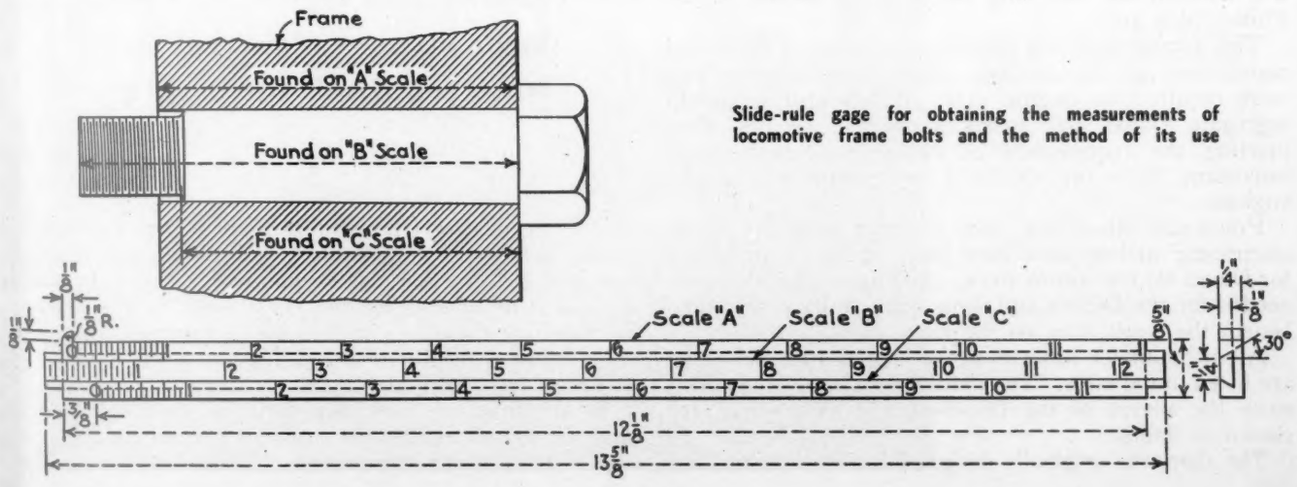
Welding Patches on Barrels of Locomotive Boilers

Q.—On page 200 of the May, 1941, *Railway Mechanical Engineer,* under the heading of "Seal Welding of Boiler Shell Patches," appears this sentence, "The Bureau of Locomotive Inspection proposed rules for welding provides that welding shall not be applied to any part of the barrel, etc." This, of course, was a proposed rule. Is or was there a rule or ruling relating to the welding applied to the barrel of a locomotive boiler? Say, to seal the caulking edge of a patch? If there is, can you quote it.—E. L. V.

A.—The Bureau of Locomotive Inspection does not have any ruling which would permit welding to seal the caulking edge of a patch applied to the barrel of a locomotive boiler. The proposed rules and instructions governing the use of fusion welding on locomotives, boilers, tenders and parts and appurtenances, thereof, as issued by the Bureau of Locomotive Inspection, I. C. C., state as follows: Rule 4 "Barrel, dome, drum and hip sheets. Welding shall not be applied to any part of the barrel, dome, drum, or hip sheet of any boiler unless the stresses to which the part is subjected are carried by other construction that will maintain the required factor of safety. This will not prohibit welding of joints of shell sheets at ends of butt straps to seal leakage or prohibit the welding of staybolt sleeves or caps in that portion of the barrel into which the combustion chamber extends." The fact that the stresses on the barrel of locomotive boiler are not carried by any other construction would prohibit welding on the same. I do not believe that the exception, which permits welding of joints of shell sheets at ends of butt straps to seal leakage, could be construed so as to apply also to seal welding the caulking edge of a patch.

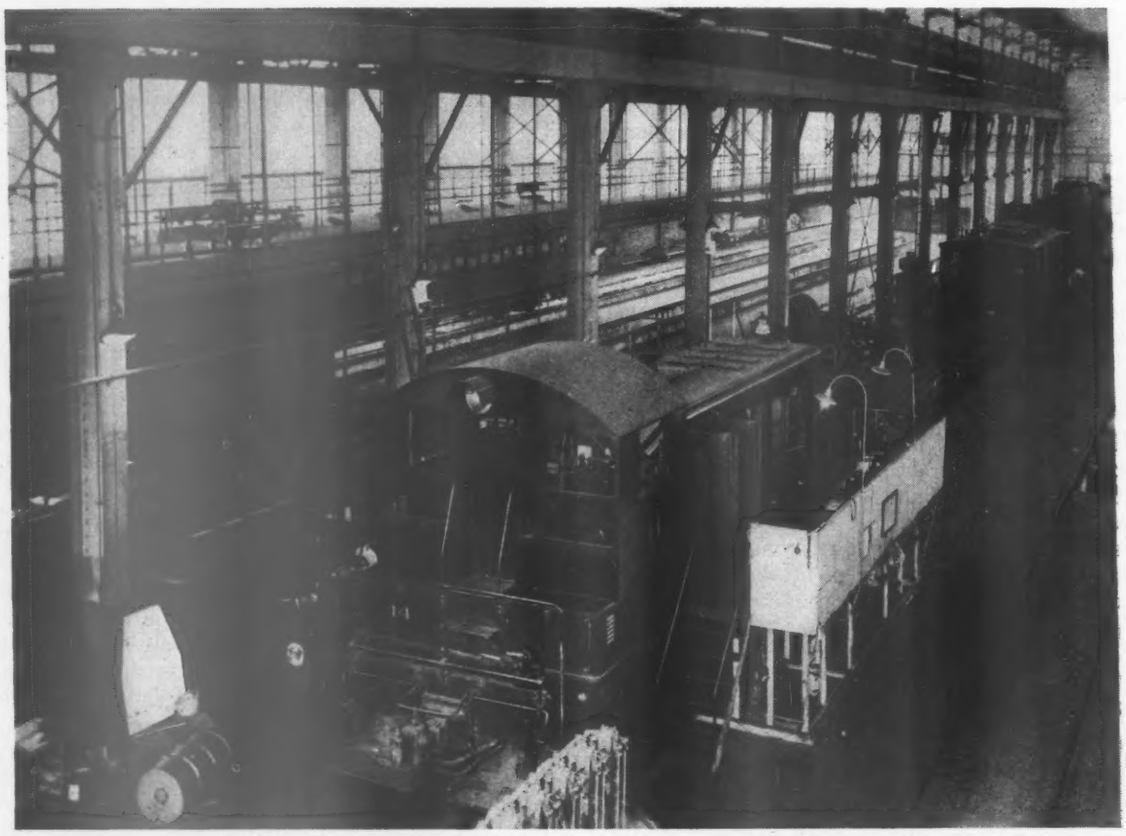
Slide Rule Gage For Selecting Frame Bolts

The accompanying drawing shows the details of a slide rule type of gage for use in obtaining the measurements for selecting and making locomotive frame bolts. The gage itself consists of two parts—the body on which scales *A* and *C* are graduated, and the slide operating in a dovetail slot on which scale *B* appears. All three scales are graduated in eighths and sixteenths of an inch. The body of the scale has a hooked end at the side on which scale *A* appears, the purpose of which is obvious. Scale *A* is used as a hook scale to obtain the measurement through the frame, as shown in the lower portion of the drawing. Scale *C*, it will be noticed, is graduated so that the zero and all inch divisions on the scale are a one-fourth inch differential from scale *A*. Scale *C* is used to obtain the dimension of the unthreaded portion of the bolt body and the one-fourth inch differential allows for the draw. In using the gage, scale *B* is set to the thickness of the nut wanted on the frame bolt by setting the dimension representing thickness opposite the zero on the *A* scale. The measurement through the frame can be taken as a direct reading on the *A* scale, and directly opposite that point the other dimensions may be obtained. These are the full length of the bolt under the head from the *B* scale, and the length of the unthreaded portion of the bolt body, from the *C* scale.



Slide-rule gage for obtaining the measurements of locomotive frame bolts and the method of its use

Electric Shop Takes Diesel Boarders



Looking north across the heavy-repair tracks in the center bay—Elevated tracks in the inspection bay may be seen at the left

Reading finds practically all shop equipment used for m. u. electric cars needed for Diesel locomotives—additional facilities required for engines

BENEFITING by years of experience in maintaining m. u. electric cars, Diesel-electric locomotive maintenance was also organized in Reading's multiple-unit shop at Wayne Junction, Pa., when this type of motive power was adopted for switching and transfer service in the Philadelphia area.

This arrangement has placed in the hands of the Diesel maintainers all the facilities which experience showed were required by electric cars. It has also served to segregate Diesel and steam locomotive repairs, thus meeting the requirement of cleanliness which is so important both for electrical equipment and Diesel engines.

Practically all of the shop facilities used for m. u. electric-car maintenance have been found advantageous for Diesel-electric locomotives. Additional facilities were needed for the Diesels and some of these have served to benefit the work done on the m. u. cars.

All of the major facilities at the Wayne Junction shops are listed in the table. The items which have been added since the advent of the Diesel-electric locomotives are shown in italics.

The shop was originally designed for the maintenance of 120 m. u. cars. By dint of management and experience, it has become possible to include also the maintenance of 48 Diesel-electric locomotives in the same shop. Special requirements for the Diesels are floor space for overhauling of engines and facilities separated from the shop for cleaning filters and engine parts. This requires plenty of hot water and steam.

In a number of cases, new facilities absolutely necessary for Diesel maintenance can also be advantageously applied to m. u. car maintenance. This is one reason why

Looking south in the inspection-track bay—The center bay with its heavy-repair tracks is at the left

General view of the machine-shop bay looking north—Heavy-repair tracks on the left

The armature extractor

One of the more common types of pullers removing a V pulley from a Diesel exciter and control generator

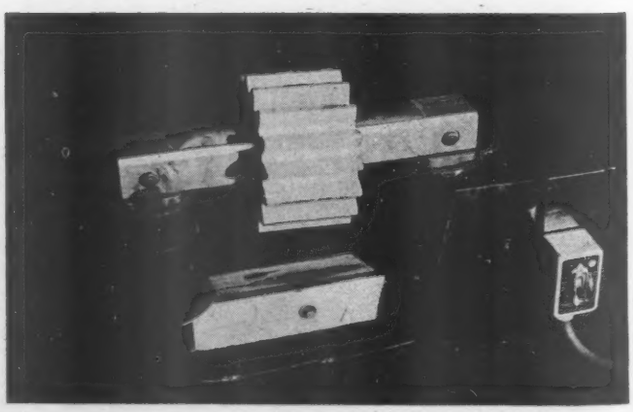
Shop Equipment Used for M. U. Electric Car and Diesel-Electric Locomotive Maintenance at the Reading's Wayne Junction Repair Shop*

1—Repair and inspection shop, 138 ft. 4 in. by 325 ft. 0 in.
2—Five through tracks, including two heavy-repair tracks with 210 ft. inspection pits and three tracks with full-length inspection pits.
3—Four 35-ton Whiting electric (synchronized control) car hoists.
4—Machine shop, 30 ft. by 122 ft.
5—Storeroom, 30 ft. by 61 ft.
6—25-ton Niles crane traveling over two heavy-repair tracks, span 42 ft. 1 in., main hoist 25 tons capacity—auxiliary hoist 5 tons capacity.
7—One 7½-ton Niles traveling crane over machine-shop bay, span 30 ft. 0 in. operated from floor.
8—30-ton capacity lifting beam.
9—G.E. portable arc welder, motor 440 volts a.c., generator 25 volts and 300 amp. d.c.
10—Motor-driven Putnam 42-in. wheel lathe.
11—Electric baking oven manufactured by Despatch Oven Co., 9 ft. by 9 ft. by 8 ft. deep, two tracks and two six-wheel trucks.
12—Three dipping and cleaning tanks, 4 ft. by 4 ft. by 10 ft.
13—Filter press, 4 to 7 gals. per min., Westinghouse motor-driven.
14—20-in. Rockforn shaper.
15—Peerless 4½-in. by 4½-in. dry-cutting power saw.
16—Barnes two-spindle 20-in. drill press.
17—Two Model K-3 high-speed sensitive drills.
18—Dreses 5-ft. radial drill.
19—14-in. by 8-ft. engine lathe.
20—24-in. by 10-ft. engine lathe.
21—Blount 30-in. wet tool grinder.
22—Hammond double emery grinder.
23—Peerless universal armature machine.
24—Armature extractor for traction motors.
25—Two armature winding stands.
26—Two m.g. sets for battery charging, one for m.u. cars and one for Diesels.
27—Motor-driven compressor, 12 in. by 10 in., class BR 1, with after-cooler and storage tank.
28—Portable rivet-heating furnace.

it has been possible to include the Diesels without making the shop inadequate for both. With a few exceptions, the electrical repair equipment in the m. u. shop is more than adequate for serving electrical requirements of the Diesel locomotives.

No changes were required in the layout of the shop except the extension of one of the original inspection pits on one of the two heavy repair tracks. This pit was extended and provided with reinforced jacking foundations outside the track gauge. Hoists (item 3 in the table) were added since the crane capacity was not sufficient for the Diesels. All locomotives have four-wheel trucks.

The original storeroom was inadequate for both m. u. cars and Diesels. Line materials for the overhead contact system of electrification were formerly kept in the



A pinion heater

29—Portable welding and cutting outfit.
30—Two test racks for air-brake equipment, one for m.u. cars and one for Diesels.
31—Small baking oven.
32—*Valve facing equipment (portable).*
33—*Wire brush machine (portable).*
34—*Cylinder-head reconditioning tools.*
35—*Cylinder liner hone.*
36—*Commutator dressing tool for in-place reconditioning with shop-made jigs for main generator, auxiliary generators and traction motors.*
37—Shear for cutting light metal and insulation material.
38—Induction-type heater for motor pinions.
39—Various types of pullers for removing pulleys, gears and couplings.
40—*Hand pyrometer for taking exhaust temperatures.*
41—*Diesel-engine-oil flushing equipment.*
42—*Wrenches, socket, open-end, box, ratchet.*
43—*Injector, nozzle and fuel-injection pump testing devices.*
44—*Air-intake-strainer cleaning tanks.*
45—Diesel-engine-parts cleaning tanks.
46—All necessary equipment for testing meters, relays, regulators, etc.
47—Gauge tester (oil and air).
48—Gas-electric crane truck, 1½ ton.
49—Four elevated work platforms (running-board height equipped with lighting, vise bench and storage shelves—one has tool rack.
50—Shop heated with unit steam heaters.
51—*Motor-driven ventilator for removing exhaust gas fumes from shop.*
52—*Floor benches (air-brake work done on balcony).*
53—Wheel storage outside shop.
54—*Bench trays for cleaning small Diesel parts.*
55—One-ton service (highway) truck for work in field.
56—*Portable all-purpose motor-driven pump.*
57—Magnaflux testing machine.
58—Fully equipped blacksmith shop, oil-fired forge, air hammer, small hand tools, etc.

* Items of equipment added since the advent of Diesel-electric locomotive maintenance are printed in italics.

storeroom and these were moved to another building. Some material was moved to a room in the basement and shelf space was increased about 50 per cent.

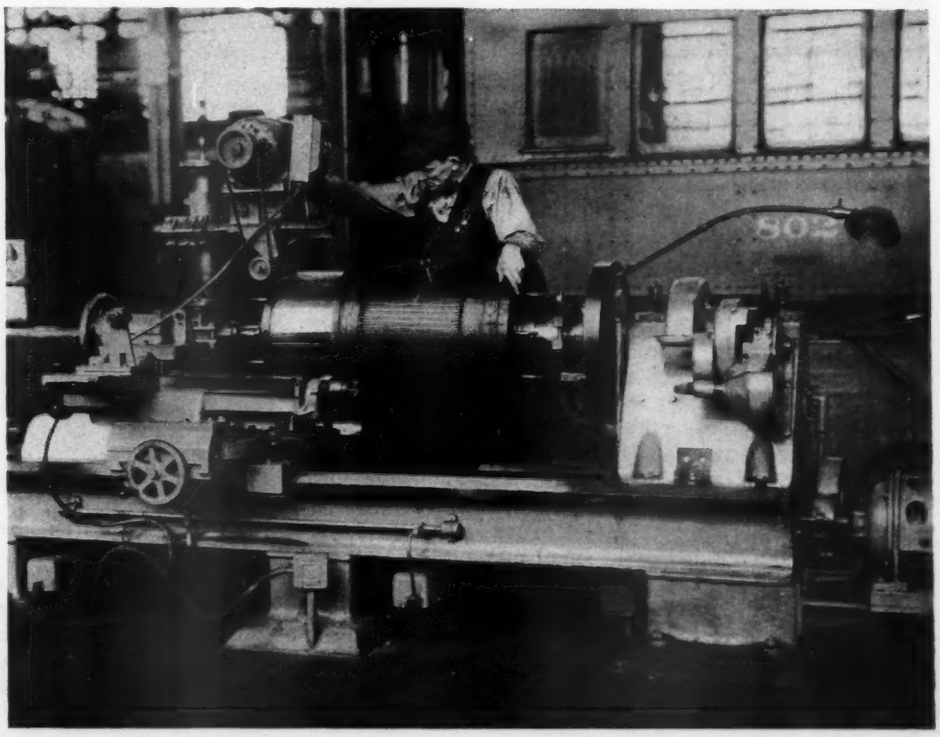
The 42-in. wheel lathe (item 10 in the table) was adequate for m. u. cars but it cannot be used on some locomotives which have larger journal sizes. The increased mileage now being made by m. u. cars has also put an added load on this lathe and it will be replaced by one of greater capacity. The small lathes (items 19 and 20) are used for bearings, bushings and general work.

The armature extractor (item 24) was made for m. u. traction motors and will also handle certain types of Diesel traction motors. It is not large enough for generators and will be supplemented by another extractor of sufficient size.

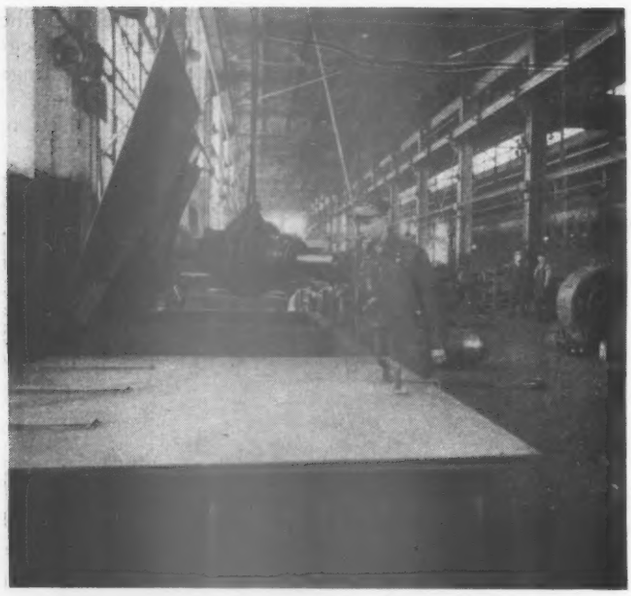
The shop was originally equipped with one motor-generator set for charging of m. u. control batteries. The second machine was made necessary because the locomotives employ larger batteries having voltage ratings up to 125, while the m. u. cars use 32-volt batteries.

The motor-driven compressor (item 27) is used to

The meter repair room



One of the lathes as used for commutator slotting



The dipping tanks for cleaning fluids and insulating varnish

Grinder attached to brush studs used for truing generator commutators

supply air for the operation of shop tools and other facilities.

The portable valve-facing equipment (item 32) is used for facing all intake and exhaust valves and is exclusively a Diesel facility.

The Diesel-engine-parts cleaning tanks were installed as a Diesel locomotive facility but have been found highly useful for m. u. cars. Electric immersion heaters are used for heating the cleaning solution.

Equipment for testing meters, relays, regulators, etc. (item 46) is all included in the small shop on the balcony. In this shop one man repairs cab signal relays for all Reading cars and locomotives, relays for m. u. cars and Diesel locomotives, all electric meters used on the railroad, rejuvenates Pliotron tubes, etc.

The gas-electric crane truck was installed for work on Diesel locomotives and also does some other shop work. About 90 per cent of its time is used in connection with locomotive repairs.

The elevated work platforms (item 49) are located on the section of tracks assigned for Diesel monthly inspection, annual inspection, and in running repair work. These platforms are exactly the same height as the deck of a Diesel locomotive and of length equal to that of the longest piece of equipment in service. On one platform is located a work bench with the various facilities needed for overhauling fuel injectors, cylinder heads, and other light engine accessories. The floor between the inspection tracks is depressed so that the top of the rails are about 24 in. above the floor. There are also full-length pits between the rails. Tool storage bins have been installed in three of the platforms. When it is necessary to overhaul a Diesel engine completely, the engine is removed from the locomotive, torn down, repaired and reassembled on the shop floor.

When the Diesel locomotives were brought into the shop a motor-driven ventilator for removing exhaust gas fumes was placed in the roof. Experience indicates that this type of ventilator is inadequate and that a hood is required directly over any locomotive which may have to be operated in the shop. The roof ventilator will remove a major part of the exhaust gas but will not prevent dissipation of objectionable fumes throughout the shop.

The one-ton highway service truck (item 55) was installed for servicing all Diesel locomotives anywhere in the Philadelphia area. It has also been found highly useful for emergency requirements of m. u. cars.

The Magnaflux testing machine (awaiting delivery),

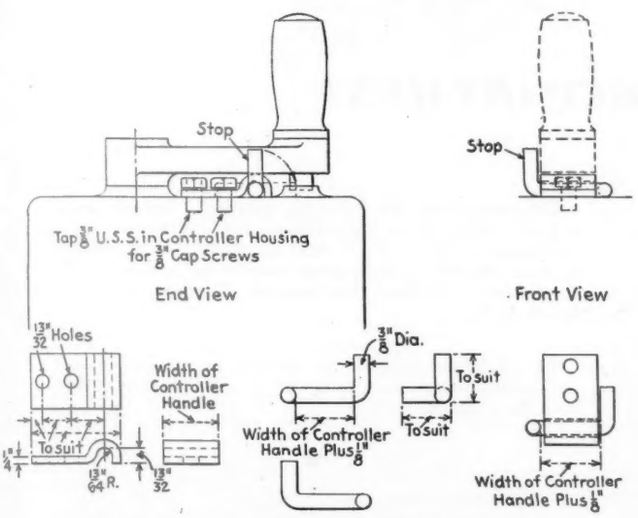
An m. u. transformer goes into the baking oven

installed primarily for Diesels, will also be useful for m. u. cars. It is especially effective for Diesel connecting rods, crank shafts, armature shafts and roller bearings.

The Diesel locomotive repair facilities were planned and their installation directed by E. P. Gangewere, superintendent of motive power and rolling equipment.

Turntable Motor Saver

Ever since there have been electrically-operated turntables, the motors on this most vital piece of equipment have been subject to abuse. Operators are many and varied and most of them have little consideration for motors. This situation in most cases is aggravated by



Details of parts required for making the stop

Top of turntable controller showing the handle in neutral position against the stop

the fact that the type of controller most commonly used is one in which the handle can be moved from forward to reverse without delay, and the net result is that when the table goes by the right track, the operator throws the controller into reverse without using the brake. By this procedure he saves time and perhaps avoids criticism from the man on the engine. Unfortunately it is rough treatment both for the motor and the drive.

The simple but ingenious device shown in the illustrations was developed on the Chicago, Rock Island & Pacific to avoid this difficulty. When operating in either direction, the stop is always up at the neutral position. When the handle is moved from a running position to neutral, it runs into the stop and it is necessary for the operator to move the stop from one position to the other before he can put the motors in reverse. The little time required to do this saves the motors and improves table operation.

Substitute Solders and Babbitts

General Electric research and experiment has produced a number of solders and babbitt alloys containing little or no tin which are generally satisfactory and has also developed techniques for using them. Changes in the composition of solder and babbitt used by the company since Pearl Harbor have resulted in the saving of 850,000 lb. of tin. Present practices are as follows:

For general-purpose work a solder containing 20 per cent tin, 1.25 per cent silver, 1.5 per cent antimony, and the balance lead may be employed. It can be used with non-corrosive fluxes such as rosin or aniline phosphate, on bare, pretinned, or cadmium-plated surfaces; a corrosive flux, such as the zinc chloride types, is used for bare steel and zinc-plated copper or steel. Rupture strength at elevated temperatures is better than that of 40-50 per cent in tin-lead solder. This 20 per cent tin solder is the most popular solder in use today. It is being used in wire form, both solid and rosin-cored, for all types of electrical connections which formerly were made with solders ranging from 40 per cent tin, 60 per cent lead to 60 per cent tin, 40 per cent lead. About the only change in technique required to use the lower tin solder is to use a hotter soldering iron since the 40 per cent tin solder melts at 455 deg. F. and the 20 per cent tin solder at 518 deg. F. This new solder is also used in larger solder pots in place of 40 per cent tin solder for soldering armatures.

A silver solder, containing 2.5 per cent silver and the balance lead, and melting at 579 deg. F. is used chiefly for applications requiring high rupture strength at elevated temperature. This solder does not flow and wet as readily as pure tin. It calls for a corrosive flux on bare surfaces, but rosin flux can be used on pretinned surfaces. It is used chiefly for soldering rotor binding bands.

Two compositions are being used for pretinning or dip-soldering in solder pots, but neither is recommended for soldering-iron work. One consists of 10 per cent tin and 90 per cent lead, and melts at 567 deg. F.; the other has 10 per cent tin, 1.5 per cent silver, and 88.5 per cent lead. The second has somewhat better spreading creep qualities. Zinc chloride (corrosive) type flux is used, with subsequent washing to remove flux residue.

A solder containing 30 per cent tin, 2 per cent antimony, 1.25 per cent silver, and 66.75 per cent lead is used for soldering wiped joints. While it handles well, it is more susceptible to porosity than a 40 per cent tin, 60 per cent lead wiping solder.

It has not been found possible to change to low tin solders for every application. Soldering commutator-winding joints still requires 100 per cent tin solder. Such joints are subjected to moderately high temperatures for a soldered joint and are under high stress, demanding a solder with high temperature rupture properties. The necessity for use of a non-corrosive flux also limits the choice of solders to those which wet and flow readily with a rosin flux.

New Babbitt Alloys

Babbitt alloy, used in lining bearings, previously contained 83⅓ per cent tin, and 8⅓ per cent each of copper and antimony. Today's tin conservation order of the WPB restricts tin content in babbit to 12 per cent, except for implements of war, in which case high tin content babbitts are still permitted unless a lower tin con-

tent is practicable. The alloy used by the General Electric Company today contains only 1 per cent tin. The remainder consists of 15 per cent antimony, 1 per cent arsenic, 0.5 per cent copper, and 82.5 per cent lead. This composition is available from many metal producers.

This lead-base babbitt was subjected to tests in the G. E. laboratories and engineering departments, and is now generally used for all babbitted bearings except those on large turbine-generator sets, on guide and thrust bearings for vertical water-wheel generators, and for implements of war where high tin babbitts are specified. Field experience with lead-base babbitt for large turbine-generator sets and large vertical generators is being obtained.

Lead-base babbitt has been substituted for tin-base babbitt with no change in bearing design, and the lead-base bearings carry the same unit loads or pressure as did the tin-base babbitts.

CONSULTING DEPARTMENT

Speed Reduction for Motor Drives

When a low-speed machine is to be driven by an electric motor, what factors determine the type and method of drive?

Can you answer the following question? Suitable answers will be considered as contributions and will be published in a subsequent issue. If you have questions to ask, send them in also. Answers and questions should be addressed: Electrical Editor, *Railway Mechanical Engineer*, 30 Church Street, N. Y.

Do electrical contacts on starters and circuit-breakers burn away faster in air or in oil? Opinions seem to be contradictory.

●

There is a Place for Each Type

In selecting the type and method of driving a machine with an electric motor, the factors to be considered are size of the load, first cost of the motor, speed ratio desired, possible peak loads, the positiveness of the drive, the space available for the drive, the noise of the drive and the permissible level, the quality of the maintenance force on hand, the appearance of the coupled set and other factors governed by local conditions.

Direct Coupling: The simplest solution to the method of drive is undoubtedly direct coupling with an electric motor of the same speed as the machine to be driven. The most economical drive is usually at 1,800 r. p. m. High-speed motors are cheaper, operate at lower power losses, better power factor and higher torque than do slower speed motors. This difference in performance characteristics is more marked in the smaller sizes, particularly as to power factor. Increase of motor speed increases the cost of a motor due to features added to withstand higher centrifugal forces. On the other hand, low speed will result in high cost due to the greater flux and torque required and the resulting increase in size. This relation is shown in Horsepower $= K$ x torque x speed. For a given horsepower, if the speed is decreased, the torque must be increased. Torque may be increased by a higher investment in the windings to create the additional flux and in the steel to provide a suitable path for the added flux.

Direct drive with flexible or rigid coupling is often an economical solution with motors of 3,600, 1,800 or 1,200 r.p.m. motors of smaller sizes if the machine to be driven is designed to operate at the same speed. Larger motors, normally built at lower speeds, may also be economically coupled directly at lower speeds. In cases where the cost of the slower running motor would be prohibitive for direct coupling, belts, chains or gears must be used.

Belt Drive: This method of speed reduction is the least expensive. The maximum speed ratio is limited by the practical sizes of pulleys obtainable, belt embrace on smaller pulley and the practical distance between centers. Maximum speed ratios are limited to: 10 to 1 for fractional horsepower motors, 6 to 1 for ordinary sizes and 4 to 1 for sizes of 50 hp. and up. When the pulley diameter of the driven machine is fixed, the required speed ratio is obtained either by using a lower speed motor with normal pulley or an 1,800 r.p.m. motor with smaller pulley. As the diameter of the pulley is reduced, however, the strains on motor bearings and shafts are increased until the minimum permissible size of pulley is reached. Other factors to be considered are belt size, type and tension, number of belts and pulleys, slippage and the necessity of using idlers.

The application of properly adjusted, spring-loaded, pivoted motor base drive eliminates the necessity of close supervision and periodic belt take-ups.

Where the available space is limited, V-belts may be used. While costlier than flat belts, they require less maintenance, are less noisy, less dangerous and do not need idlers. V-belts must however be aligned more carefully as to parallelism of shafts and lateral misalignment to avoid unequal stretch, side wear and belt climbing. The limitation to the use of a V-belt is its stiffness in the larger sizes and its inability to adapt itself to the surfaces of smaller diameter sheaves as good as a light, flat double belt would. To be sure, a wider sheave with a greater number of smaller V-belts could be used, but that, at the expense of extending the center of the belt away from the bearing and producing an undesirable leverage on the bearing and shaft. Therefore, for large horsepower loads on higher speed motors, the use of V-belt must be avoided due to minimum pulley limitations.

Chain Drive: Beginning with speed ratios of 8 to 1, the use of silent chains becomes a possibility. Chain drive is also the solution where distant centers exclude the advisability of using a gear drive due to the resulting excessive pitch line speeds. Its use is most common in multiple drives to conveyor chains too long to be driven from a single point or other multiple drives. It is best suited for the transmission of heavy loads on short centers, at moderate and low speeds and without slip. Its use may also be necessitated by high temperatures, grease, oil, dust, steam or moisture saturated with corrosive fumes in sufficient quantities to prevent the use

of rubber or leather belts. Where the motor pulley diameter has to be so small that the bearings will not stand the tension of a belt drive, a chain drive may be the proper solution irrespective of the amount of power to be transmitted. For, with a chain drive, first, no tension is necessary in the slack side, and second, the chain sprocket may be placed close to the bearing, thereby reducing leverage.

In applying chain drive, the most important factors to be considered are size of load, size of sprockets, speed ratio, width of chain, chain speed and chain noise. While chain speed may be raised to as high as 1,500 ft. per min., for quietness and smoothness a chain speed of 600 ft. per min. should not be exceeded. Even at these speeds, however, a chain drive is usually noisier than a belt drive.

A disadvantage in the use of chain drives is the serious result of a failure at the chain hinges. This failure has the effect of increasing the chain pitch at that point and causing hammer blows on the sprocket teeth every time the defective spot goes around. The resulting jar may loosen and destroy bearing babbit in the shell, pound the shell loose in the motor end shields to the extent of wearing out the reamed opening too large for a standard replacement bearing. It is obvious that the motor windings would also suffer from the sharp jolts and have shorter life.

In view of the foregoing, the application of a chain drive should be carefully planned to avoid noise and vibration and then properly maintained to avoid failures and unnecessary damage to property. When chains are operated at low and moderate speeds, over pinions having adequate number of teeth, with worn out hinges promptly repinned with oversize pins, they operate as smoothly and satisfactorily as belts.

Gear Drive: Gears give an absolutely positive drive but are relatively more expensive. Having the possibility of much larger speed ratios, they cover a wider field than belts and chains. They are used where slip in the drive is not permissible. They are also preferred where belt breakage or chain failure would be dangerous. While the maximum speed ratio obtained from a pinion and gear is about 10 to 1 with a single set of gears, any ratio may be obtained by coupling together several sets of gears. Maximum pitch line speed of steel pinions with cut gears run open should not exceed 1,350 ft. per min. Due to rim speed limitations, the pinion diameter of the motor should not be smaller than half the diameter of the standard motor pulley. Gear drives are relatively more compact and therefore take up less space. In the production of noise, they compare favorably with the other types of drives, while some types of gear drives are remarkably noiseless.

Gear reduction units are of various types depending mainly on the speed ratio required, the capacity to be transmitted and the type of service. The types most commonly used are the single or two stage worm reducer, the single or two stage herringbone reducer, the single spur gear reducer and the gear train. In designing a gear drive, the factors to be considered are the capacity to be transmitted, speed ratio, gear sizes, pitch line speeds, available space and the permissible level of gear noise.

While some gear reducers are built on the motor end shield for compactness, the present day tendency of most economical use of material on motor frames resulting in less rugged construction together with the lack of flexibility of replacing a driving motor for repair and periodic overhauling make the use of a separate reducing unit more advisable. In stocking spare parts for replacement, it may also be important to consider that a gearmotor usually costs about twice as much as an 1,800 r.p.m. motor with belt drive. However, when confronted with the lack of adequate space and competent force of maintenance to properly care for troublesome belt drives, the choice invariably points to gearmotors. According to the severity of service, gearmotors are made for uniform loads, moderate shock loads and heavy shock loads.

When the ratio of speed reduction for a small or medium capacity drive is very large, a two-stage worm reducer is the best drive.

For small and medium capacity drives of large speed reduction ratio, the single worm gear may be used. Where price and definite shaft position are not controlling factors, the spiral bevel plus herringbone reducer or the double herringbone reducer results in a more efficient unit.

For smaller ratios of speed reduction and higher capacities, spur gears of various types may be used.

For still smaller ratios and larger capacities, the single or two stage herringbone and spiral bevel gear reducer are the proper drives.

Gear and Belt Drive: It may be advisable in some drives to follow a gear drive with a belt drive to obtain the total speed reduction. The advantages of such a drive are the possibility of change of speed ratio and cushioning of shocks by belt frequently protecting the gears and the driven machine against sharp and severe shocks.

In general, it may be stated that very little competition exists between belt drive and gear drive, especially in the higher speed ratios. Each is best suited for a particular field of application. The overlapping of the feasibility of application of either method of speed reduction occurs at a speed ratio of about 10 to 1, where flat belt with spring loaded pivoted motor base drive and gear drive are almost equally well suited, if the totally enclosed feature of the gear drive presents no added inducement.

R. G. Cazanjian
Supervisor
Triborough Bridge Authority
New York

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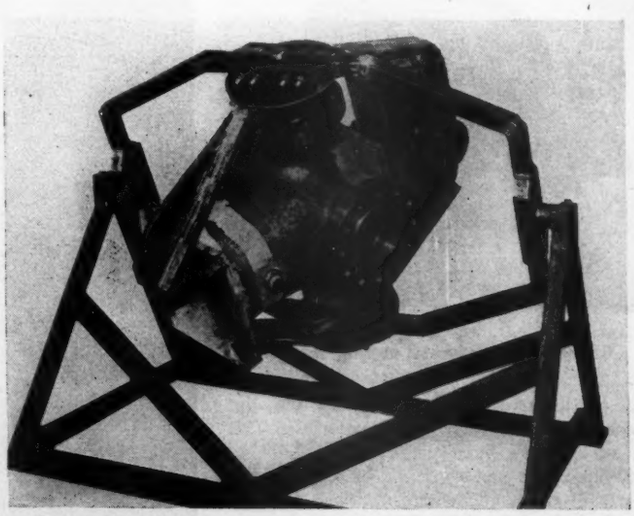
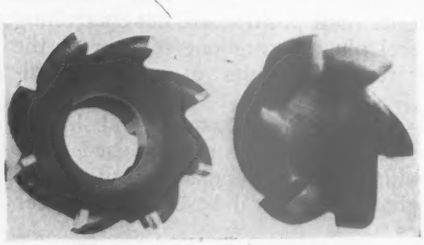


Gimbal-type welding positioner built of salvaged bar stock at the Erie Works of the General Electric Company

NEW DEVICES

Milling Cutter Bodies

Milling cutter bodies made of meehanite are produced by Farrel-Birmingham Company, Inc., Ansonia, Conn., for use in machine shops in making up cutters for various applications. They can be machined

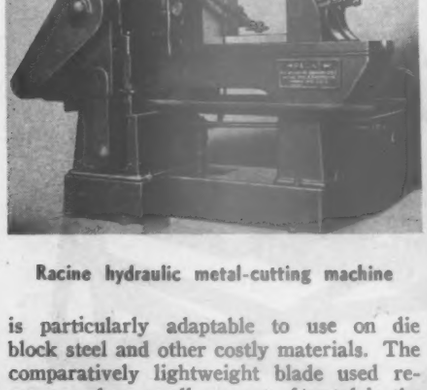


Cutter body blanks can be prepared for required milling operations

for carbide or cast-alloy tips within a broad range of rake and spiral angles. Users face, bore and slot the hubs as required, mill the tooth seats and braze on the desired tips. Meehanite has high damping capacity which permits high operating speeds with reduced chatter and longer tip life.

Heavy-Duty Hydraulic Metal-Cutting Machine

The Racine Tool & Machine Company, Racine, Wis., has announced the development of a new 20-in. by 20-in. capacity metal-cutting machine known as their Model 36C. This machine has been designed primarily to provide low cost cutting with a thin cutting tool in large size materials. It is claimed that this machine



Racine hydraulic metal-cutting machine

is particularly adaptable to use on die block steel and other costly materials. The comparatively lightweight blade used removes only a small amount of metal in the form of chips, and where multiple cuts are made it is claimed a substantial saving results from this feature alone.

This machine is hydraulically operated, full control being placed on a single lever. A special dual-type feed is used which the manufacturer claims is an exclusive feature possessing novel advantages. It provides a fast-cutting speed in light materials and yet is arranged for a positive predetermined rate of cutting in die blocks, alloys and tool steel. A three-speed transmission provides cutting speeds of 55, 85 and 115 strokes per minute. A 3-hp. motor drive through V-belts is connected to the three-speed transmission by a twin disc clutch.

Reclining Coach Seat

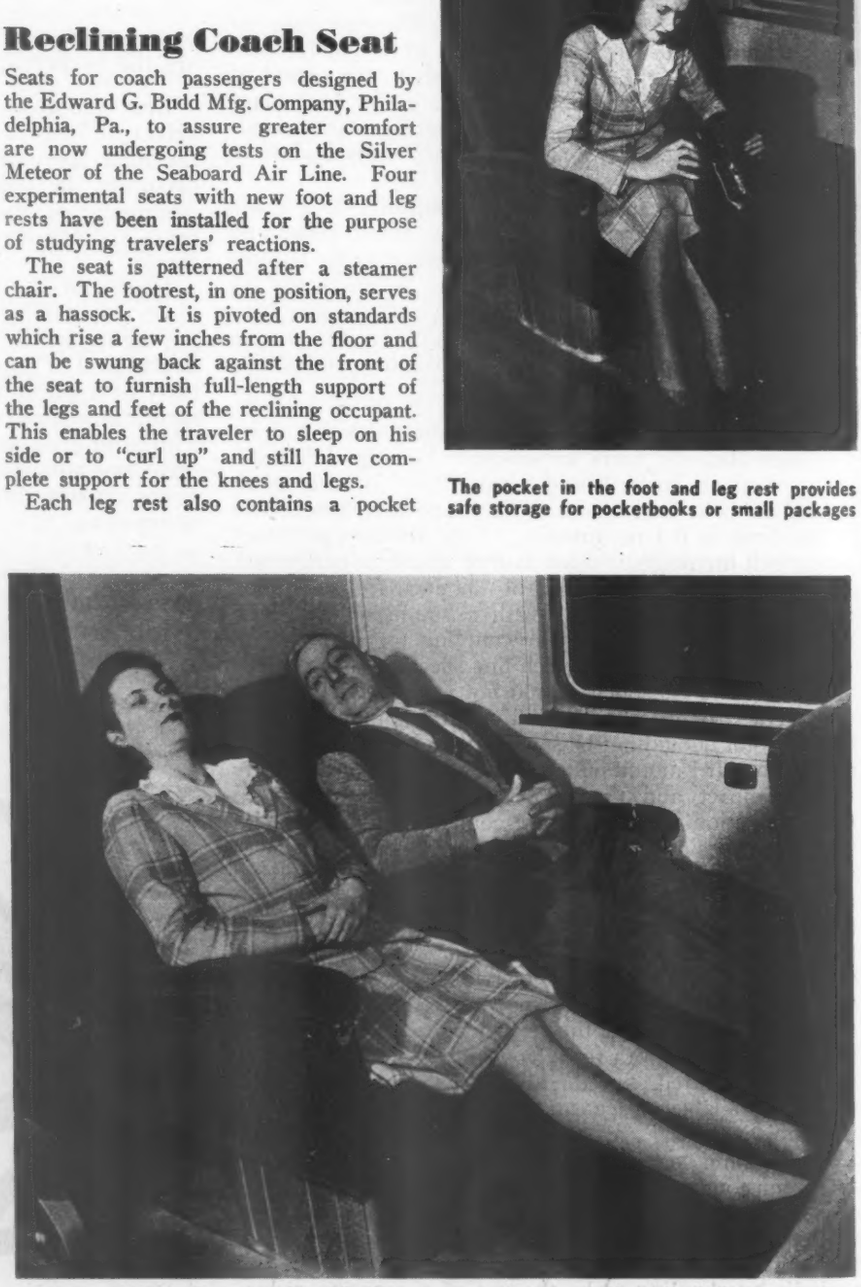
Seats for coach passengers designed by the Edward G. Budd Mfg. Company, Philadelphia, Pa., to assure greater comfort are now undergoing tests on the Silver Meteor of the Seaboard Air Line. Four experimental seats with new foot and leg rests have been installed for the purpose of studying travelers' reactions.

The seat is patterned after a steamer chair. The footrest, in one position, serves as a hassock. It is pivoted on standards which rise a few inches from the floor and can be swung back against the front of the seat to furnish full-length support of the legs and feet of the reclining occupant. This enables the traveler to sleep on his side or to "curl up" and still have complete support for the knees and legs.

Each leg rest also contains a pocket into which can be placed for safety and convenience a woman's large pocketbook, shoes or small packages. The opening in this pocket is closed when the rest is in either the up or down position.

Another feature of the seat is the wide center arm rest which has been made the full width of the outer arm rest. Seat and footrest occupy 58½ in. of floor space.

The pocket in the foot and leg rest provides safe storage for pocketbooks or small packages



A coach seat which supports the reclining passenger from head to foot

Down Cut Milling Machine

The Model No. 4 milling machine with twin lead screws capable of down-cut milling on a precision, high-speed production basis is being built by the Bremacc Corporation, Detroit, Mich.

This machine uses two unsplined lead screws that are so connected in relation to each other that the effective bearing surface with the feed nut is constantly in tension by the use of a back-lash eliminator conventionally arranged outside the gear housing in the table. Axial play in the

Precision down-cut milling machine

thread shoulders of the lead screws is entirely avoided whether the table moves with or against the cutter in heavy feed or rapid traverse. A housing cast integral with the table, which carries all of the thrust loads, contributes to the sturdiness of this assembly.

Accuracy of the plane of travel of the work table is provided by two conventional dovetail ways. The rear slide is securely mounted and permanently fixed, while cross adjustment of the front slide is accomplished by means of adjusting screws without removal of the table, a method which avoids the necessity of taper gibbing. The slides receive lubrication from a gravity system, wick-fed by a large permanent reservoir passed into the table itself. The table is amply channeled and assures rapid disposal of cuttings, regardless of the accumulation. The coolant return is through a channel in the center at the rear side of the table.

The table feeds range from ½ in. to 30 in. per min. arranged by a change of pick-off gears. Rapid traverse has a standard table movement of 125 in. per min. Both table feeds and rapid traverse can be operated manually or automatically in either direction. Automatic reversing and jump feeds are also available which permits the use of work fixtures on both ends of the table.

The main gear box has two speeds, high and low range, in connection with spindle speeds. This provides a semi-quick change of the spindle speed, together with pick-off gears which are accessible through a hinge cover at the rear end of the spindle housing. All pick-off gears, both feed and speed, are splined and run in oil.

A heavy-duty disc plate clutch is used in the main gear box. A starting lever is within easy reach of the operator. Should the operation require the cutter to be stopped at the end of the cut, the operating lever is brought to neutral position. A safety lock permits the clutch lever to function only for the particular job for which it was originally set up. This interlocking, together with the safety feature provided at the starting button, eliminate any danger of the operator going into the wrong speed or the wrong cutter rotation.

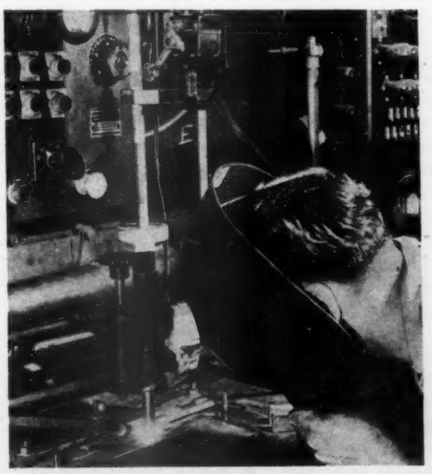
Power is supplied by an individual 10-hp. motor. The six-V-belt drive is adjustable for take-up. The motor is accessible, for service, repairs and lubrication, through a large hinged cover which has a lock-up handle.

Helium-Shielded Arc-Welding Machine

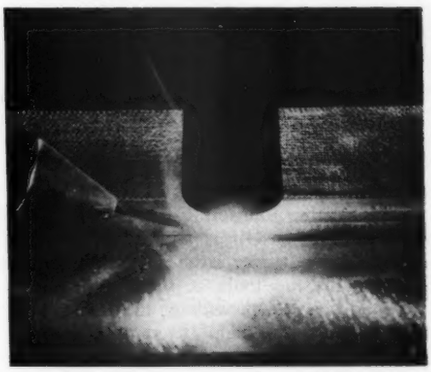
Both manual and automatic arc-welding equipment for the welding of magnesium, magnesium alloys, aluminum and other high-strength light alloys under a protective shield of helium gas, has been announced by the General Electric Company, Schenectady, N. Y.

The automatic machine illustrated incorporates an electronic motor control which enables the equipment to hold the proper arc-length even while the arc climbs and descends inclines, such as encountered in welding curved-surface parts. The filler metal is unreeled into the work at the correct angle through the small nozzle rod shown in the illustrations at the lower left. The tungsten electrode used to start and maintain the arc extends through the center of the rod that is perpendicular to the work and the helium gas is fed in around the electrode.

The rate at which filler metal is fed can



Automatic helium-shielded arc-welding equipment in operation—Electronic control panel at right controls arc length—Slanting tube (lower left) directs filler wire into the arc—All operations are controlled at panel at upper left —Tungsten electrode and gas nozzle are carried by the rod perpendicular to the work



Welding magnesium plate—Extremely accurate control of the rate of feeding the filler wire into the arc zone (through tube at left) produces the uniform bead contour shown at the right—The nozzle just above the arc surrounds the molten metal with a helium gas envelope

be adjusted to a constant uniform feed into the arc, or a supplementary control can be used to feed wire into the arc, withdraw it, and then feed it in again—all on a predetermined cycle.

The manual helium-shielded, arc-welding equipment has a specially designed electrode holder which is arranged to hold either a tungsten or a carbon electrode, to conduct the welding current to the electrode and to surround the electrode with a stream of helium gas. The source of direct-current power for both manual and automatic welding is a standard d.c. arc-welding machine.

Supplies of helium have been made available by the Bureau of Mines for welding, especially for use in war production. A number of distributors of compressed gases in different parts of the country are now obtaining helium gas from the Bureau of Mines for resale.

Spot Facer and Counterboring Tool

Forty-one standard sizes, with special sizes available on order, of a spot facer and counterboring tool with a cutter that can be removed quickly and easily for grinding are made by the J. M. Nash Company, 2354 North Thirtieth street, Milwaukee, Wis. The cutter in these tools is removed by loosening a knurled nut and cone nut after which the cutter is slipped back out of the bar. When re-sharpened, the cutter is replaced in the bar and centers itself when the cone is tightened and the knurled nut locked. Exact location is obtained by the web in the body which locates the fingers of the cutter, and the cone nut which centers the rear of the cutter on a straight line with the bar.

Cutters are easily removed from this tool for sharpening

Coolants Applied With Pressure Joint

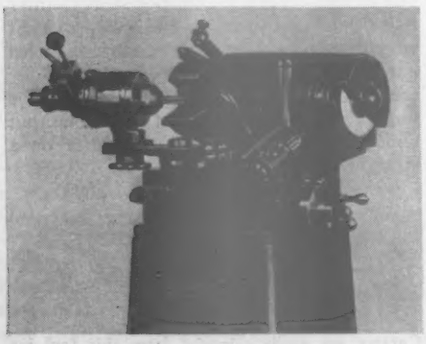
A rotary pressure joint designed to provide an adequate supply of cutting oil or coolant at the cutting surface in deep boring, drilling or reaming operations on cored castings or steel stock is manufactured by the Johnson Corporation, Three Rivers, Mich. Oil is admitted inside the spindle on a turret lathe and is conducted directly to the tools at the working end. In addition to providing lubrication the flow of lubricant helps to remove cuttings and turnings. Designed primarily for use on hand turret lathes the device can be adapted for application to other machines performing similar operations.

The pressure joint is a packless type of stuffing box or steam fit. Two carbon graphite rings are said to eliminate the need for packing and are self lubricating. Pressure within the joint is the sealing force and operates automatically to furnish as tight a seal as required. Provision is also made to compensate for vertical or horizontal misalignment. The device is said to have been adapted from successful applications made in admitting steam or liquids under pressure to rotating rolls of various types used in the paper-making and textile industries.

Tap Reconditioner

An improved design of its tap reconditioner has been developed by the Detroit Tap and Tool Company, Detroit (11), Mich. which includes a new spindle head that accommodates interchangeably a wide range of motor types. High rigidity for the spindle head and continuous adjustability for grinding-tool wear are obtained by mounting the spindle assembly on dovetail ways in the pedestal base.

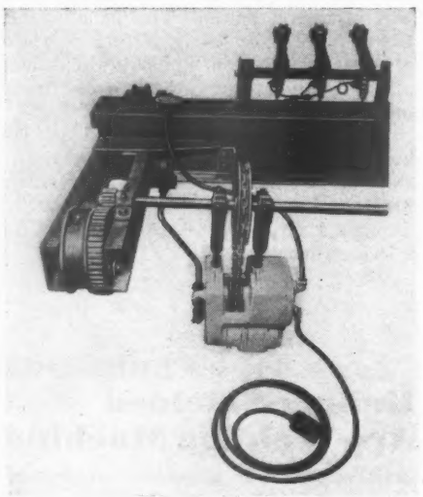
The tap chamfering unit is of the precision collet type and has also been changed to facilitate changing of taps and collets and assure maximum locating accuracy. It will accommodate collets from small machine-screw size up to the 1¼ in. standard tap shank size, including long-shank taper taps. Spiral pointing and spiral point polishing operations can be performed by integral units of the machine, the former driven from the new spindle.



Machine for accurate reconditioning of taps

Conversion Unit for Hand-Operated Crane

The bridge travel motion of hand operated cranes can now be converted to electric drive by the application of a complete self-contained electric-motor-driven unit known as the "Budgit Bridge Drive" being introduced by Manning, Maxwell and Moore, Inc., Muskegon, Mich. Installation on cranes is said to be possible within an hour without the need of machine work, drilling or fitting of parts.

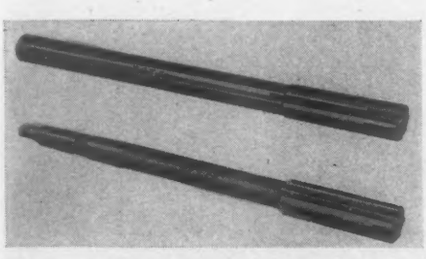


A motor-driven unit converts cranes from hand-operated to power-operated bridge travel

Cranes of either the single or double girder type of 10 tons capacity, or less, can be converted if the crane is of the geared type and operated by a chain wheel of 24 in. or smaller diameter. When equipped the cranes are controlled by a push button suspended by a cord to a convenient height above the floor level.

Hardened Shanks On Carbide Reamers

Standard sizes of carbide-tipped reamers with hardened shanks are being stocked by the Tungsten Carbide Tool Company, Detroit (6), Mich. The line comprises both straight-shank and tapered-shank types in sizes from ¼ in. to 1½ in. Up to 1 in. the reamers come in steps of 1/32 in.; above that the diameters change by 1/16 in. Reamers up to ½ in. are provided with four flutes, with six flutes for reamers from ½ in. to 13/16 in. inclusive, and with eight flutes in the larger sizes.



Shanks on these reamers have been hardened to increase strength and reduce wear

The entire shank is hardened to add strength and reduce shank wear. All tips are diamond ground with the outside diameter held to tolerances of plus 0 and minus 0.0003 in.

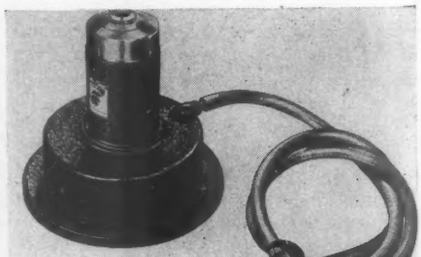
Circular Boring Tool

A boring tool intended for use on ordinary lathes which is said to approximate diamond boring machine results has been announced by the Shearcut Tool Company, Reseda, Calif. The tool has a circular cutting edge which is claimed to outlast straight edge cutting tools from 10 to 30 times before resharpening is necessary. Turning the bit in its holder provides a series of new cutting edges as they are required. It works well with either a positive or negative rake and permits working to close tolerances.

Boring Tool with circular cutting edge

Pneumatic Collet Fixture

A new precision collet fixture for drilling, milling and similar operations has been introduced by the Mead Specialties Co., Chicago. The unit is said to provide a powerful gripping action on round, hexagonal or square work pieces. Its maximum capacity is 1 in. round stock, 23/32 in. squares and ⅞ in. hexagonal pieces. The valve control may be mounted for foot operation or attached for automatic operation by the machine on which it is used.



Pneumatic holding fixture for drilling, milling or other operations

High Spots in Railway Affairs...

To Help Indian Railways

Col. J. A. Appleton, Chief, Railroad Division, Transportation Corps, was formerly general manager of the New York Zone of the Pennsylvania Railroad. Early in the year he made a trip equivalent to a distance of one and a half times round the world, during which he saw American railroad equipment in operation in Egypt, India, North Africa and England. He has also visited the Alaskan railroads. Now he expects to spend several months in India at the invitation of the government of India. He will be accompanied by R. J. M. Inglis, divisional manager of the London & North Eastern of Great Britain. They will place their advice and experience at the disposal of the Indian Railway Administration.

Human Engineering

Prof. F. C. Lea of England, in making his presidential address before the Institution of Mechanical Engineers, contrasted conditions in the engineering world with those of fifty years ago. An outstanding engineer and educator, he naturally placed special stress upon the marvelous improvements that have been made in materials. Near the close of his address, however, he made this statement: "I am conscious that emphasis has been placed on knowledge, and on scientific and technical training. Only one brief reference has been made to character, and none to one of the most important of all engineering problems—I was going to say, that of controlling other men, but I would rather say, that of working in cooperation with them. In training both workers and staff, we must keep in view more than skill and technical efficiency. These must be supplemented by common sense, sympathy and judgment, all human qualities that can be fully developed only by a wider culture than science and technology can give."

Wartime Meetings

An important aspect of any progressive organization is the inspiration and practical suggestions and plans which develop from conferences or meetings to consider current problems and to plan ahead. This practice is even more important in wartime and under prolonged emergency than in normal times. For years the official staff of the Norfolk & Western has held get-together meetings, which have proved most effective in developing teamwork and cooperation, thus making for more efficient operation. Under war conditions these have been replaced by "meetings via radio." The third one of these was held on November 15, when a 30-minute broadcast was made from 19 radio stations in West Virginia, Virginia, Maryland, North Carolina, Tennessee and Ohio. The thousands of N. & W. employees who listened in were taken behind the scenes in the main shops at Roanoke, Va. Several of the shop craftsmen were interviewed "on the job," after which President W. J. Jenks was interviewed by the radio announcer. Needless to say, the sound effects in the locomotive shop interviews were real and not simulated. There was also an interview on the assembly line in the freight car shop where heavy repairs are made to coal cars, at the rate of 16 every eight hours.

Passenger Traffic Trends

The Bureau of Transport Economics and Statistics of the Interstate Commerce Commission has made a comparison of passenger traffic for the first six months of 1943, as compared to the first half of 1938. The revenues from coach business increased 500 per cent and those from parlor and sleeping car business 315 per cent. The average journey on the individual railway in the first half of 1943 was 107 miles per coach passenger, other than commutation, and 419 miles for those in parlor and sleeping cars. The corresponding 1938 averages were 50 and 267 miles. This record is all the more remarkable because of the great increase in freight traffic in recent years and the fact that very little new equipment has been available.

A Big Gamble

The railroads are absolutely essential to the winning of the war. They are carrying a record-breaking passenger and freight traffic with inadequate equipment. The WPB has been extremely conservative in granting the railroads priorities for materials and equipment and the railroad manpower situation has become exceedingly serious. It is, of course a fine problem to determine the proper balance in the supplying of material and manpower to the different branches of the armed services and to the essential war industries. It would appear that we face a grave danger by not properly protecting the railroads. Charles H. Buford, vice-president of the A.A.R., in testifying before a special Senate subcommittee investigating the railroad transportation situation, said that during 1942 and 1943 allocations of steel rail will "fall short of minimum replacement requirements by close to one million tons." He pointed out that increasing transverse fissure failures in rails testify to the apparent need for more liberal allowances of new rails. "The number of detected transverse fissures in rail more than doubled between 1939 and 1942, increasing from 13,822 to 28,316. The number of service failures increased by 23 per cent during the same period. The derailment of trains because of failure of rail and rail joints increased progressively from 290 in 1939 to 631 in 1942."

How Many Streamliners?

The Railway Age in its "Passenger Progress Annual—War and Post-War" lists the number of so-called "streamliners" now operating in the United States. No new trains of this type were installed in 1943. The 120 trains listed operate on 25 railroads. In six cases the daily mileage per train is in excess of 1,000. These trains, which enjoyed a relatively good earning capacity in pre-war days, are now earning from 200 to 300 per cent more than at that time. They are popular with the service men who want to make every minute of their furlough count, and with civilian travelers on urgent business.

What Lies Ahead?

This question was asked by Warren Kendall, chairman of the Car Service Division, A.A.R., in an address before the recent meeting of the American Railway Bridge and Building Association. "Those who are best informed on the subject," he said, "forecast that demands for freight transportation in 1944 will require that the railroads deliver about six per cent more ton-miles than in 1943. This may need revision upward, depending upon the supplies of rubber and gasoline and the progress of the war. It seems unlikely that it will be revised downward. No great amount of new equipment can be expected within the next 12 months—perhaps 40,000 cars. Possibly 1,000 new locomotives may be made available. With the prospects of increased demands for rail transportation, and no material increase in the availability of freight car equipment, it becomes evident immediately that the roads must do even more with what they have than has been done in the past. Director Eastman of the O.D.T. is calling for a 10 per cent increase in efficiency in handling cars. He is organizing committees to that end. Judging from past performances and from the known slack which still exists, the 10 per cent may not seem too high a mark at which to shoot. Personally, I have some doubt as to our ability to reach this rather extravagant objective. We should, however, try and do nothing less than our best. If we reach five per cent, or even three per cent, we shall indeed record a performance that will go down in history as remarkable."

Among the Clubs and Associations

EASTERN CAR FOREMEN'S ASSOCIATION.—Meeting January 14, 1944, 8 p.m., Engineering Societies building, New York. Speaker: A. J. Krueger, general superintendent car department, New York, Chicago & St. Louis. Subject: "Duties and Responsibilities of the Car Department in the Operation of Today's Railroad."

Car Maintenance

EASTERN CAR FOREMAN'S ASSOCIATION.—Meeting held October 8 at New York; Subject: Various phases of car maintenance. Speakers: F. R. Carlson, vice-president, Chicago Railway Equipment Company, Chicago; H. T. Casey, sales engineer, Symington-Gould Corporation, New York, and H. A. Ryan, general car inspector, Delaware, Lackawanna & Western. ¶ The subject of brake beam failures, causes and cures, was presented by Mr. Carlson. After directing attention to the fact that very often delays which, at first, are attributed to brake beam failures are found to have resulted from other causes without a record change having been made, he pointed out that brake beams must be considered as having moving parts which are constantly being subjected to stresses or to the corrosive action of the elements. In time, he said, they must wear out. "The best formula for reducing brake beam troubles," he continued, "is to adopt the best possible brake-beam equipment. That recommendation goes for good brake shoes, good spring brake-shoe keys, good supports and good parts of all kinds. The brake beam is a most important device on a car. In the location where it is required to function any failure is pregnant with trouble. Hence the brake beam is not only deserving of a daily spot in the limelight of the train-delay reports but it is deserving of every improvement which makes for safety, good braking, or minimized wear. To be sure, even the best beams require vigilance on the part of the inspectors, but beams built to the highest standards do not place upon the inspection forces so great a responsibility that only super-human performance could hope to meet that responsibility. Also, we should never forget that a beam once used, repaired, and put back into service will again be subjected to the identical stresses and strains which it had to meet when it was a brand new beam. Accordingly, the material which goes into a rebuilt or repaired beam should be every bit as good as the standard established for new beams. And, in replacing worn out parts, the work of rebuilding and testing should be as carefully and particularly done as when the beam was originally built." ¶Snubber springs and their relation to hot-box prevention was discussed by Mr. Casey. After explaining the essential functions of snubbers in breaking up the harmonic action of spring groups and particularly the effect which snubbers have through their action in protecting unsprung car weight—truck frames, brake rigging, brasses, axles and wheels— he indicated that tests had shown a decided reduction in the number of waste grabs on snubber-equipped cars. In one test made on a Class I Eastern road over a three-month period only 123 of 1,135 hot boxes occurred on snubber-equipped cars, a ratio of eight to one. The keeping of similar records was recommended to all who had the opportunity to make such a breakdown. Mr. Casey quoted a tank-car fleet owner all of whose equipment is snubber-equipped as follows: "I honestly believe that our records will sustain our claim that snubber springs are one of the biggest factors in obtaining these results." The results referred to were savings of 16.6 cents in maintenance costs to running gear per thousand miles of service. ¶ Mr. Ryan spoke on the preparation of cars at originating terminals. He emphasized the fact that adequate and well-trained supervision was a primary consideration inasmuch as final responsibility rested upon it. After reviewing the changes which have occurred in yard car handling over a period of years, until today a minimum amount of time is allowed for such work, he concluded with the statement that it is no longer a case of making sure that a car is fit to move from the yard but, so far as is humanly possible, making certain that the car is fit to move to destination.

Directory

The following list gives names of secretaries, dates of next regular meetings, and places of meetings of mechanical associations and railroad clubs:

ALLIED RAILWAY SUPPLY ASSOCIATION.—J. F. Gettrust, P. O. Box 5522, Chicago.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS, H. H. Henline, 33 West Thirty-ninth street, New York.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—C. E. Davies, 29 West Thirty-ninth street, New York.

RAILROAD DIVISION. — E. L. Woodward, *Railway Mechanical Engineer*, 105 West Adams street, Chicago 5.

ANTHRACITE VALLEY CAR FOREMEN'S ASSOCIATION.—James Duffy, general secretary, 200 Dudley street, Dunmore, Pa. Meets January, March, May, September and November at Scranton, Pa. February, April, October and December at Wilkes-Barre, Pa.

ASSOCIATION OF AMERICAN RAILROADS. — Charles H. Buford, vice-president Operations and Maintenance Department, Transportation Building, Washington 6, D. C.

OPERATING SECTION.—J. C. Caviston, 30 Vesey street, New York 7.

MECHANICAL DIVISION.—A. C. Browning, 59 East Van Buren street, Chicago 5.

PURCHASES AND STORES DIVISION.—W. J. Farrell, Exeutive Vice Chairman, Transportation Building, Washington 6, D. C.

MOTOR TRANSPORT DIVISION.—George M. Campbell, Transportation Building, Washington 6, D. C.

CANADIAN RAILWAY CLUB.—C. R. Crook, 4415 Marcil avenue, N. D. G., Montreal, Que. Regular meetings, second Monday of each month, except June, July and August, at Windsor Hotel, Montreal, Que.

CAR DEPARTMENT ASSOCIATION OF ST. LOUIS.—J. J. Sheehan, 1101 Missouri Pacific Bldg., St. Louis, Mo. Regular monthly meetings third Tuesday of each month, except June, July and August, DeSoto Hotel, St. Louis.

CAR DEPARTMENT OFFICERS' ASSOCIATION.—J. H. Stremmel, 6536 Oxford avenue, Chicago.

CAR FOREMEN'S ASSOCIATION OF CHICAGO.—Ralph J. Feddor, 2803 North Campbell avenue, Chicago. Regular meetings, second Monday in each month, except June, July and August, La Salle Hotel, Chicago.

CAR FOREMEN'S ASSOCIATION OF OMAHA, COUNCIL BLUFFS AND SOUTH OMAHA INTERCHANGE.—H. E. Moran, Chicago Great Western, Council Bluffs, Ia. Regular meetings, second Thursday of each month.

CENTRAL RAILWAY CLUB OF BUFFALO. — R. E. Mann, Room 1840-2, Hotel Statler, Buffalo, N. Y. Regular meetings, second Thursday of each month, except June, July and August, at Hotel Statler, Buffalo.

EASTERN CAR FOREMAN'S ASSOCIATION.—W. P. Dizard, 30 Church street, New York 7. Regular meetings, second Friday of January, February (annual dinner), March, April, May, October, and November at Engineering Societies Bldg., 29 West Thirty-ninth street, New York.

INDIANAPOLIS CAR INSPECTION ASSOCIATION.—H. T. Bramblett, care of H. P. Ruck, car foreman, Pennsylvania, 764 South Emerson avenue, Indianapolis, Ind. Regular meetings, first Monday of each month, except July, August and September, in Indianapolis Union Station, Indianapolis, at 7 p. m.

MASTER BOILER MAKERS' ASSOCIATION.—A. F. Stiglmeier, secretary, 29 Parkwood street, Albany 3, N. Y.

NEW ENGLAND RAILROAD CLUB.—W. E. Cade, Jr., 683 Atlantic avenue, Boston, Mass. Regular meetings second Tuesday in each month, except June, July, August and September, at Hotel Vendome, Boston, Mass.

NEW YORK RAILROAD CLUB.—D. W. Pye, Room 527, 30 Church street, New York 7. Meetings, third Thursday in each month, except June, July, August, September and December at 29 West Thirty-ninth street, New York.

NORTHWEST CAR MEN'S ASSOCIATION. — E. N. Myers, chief interchange inspector, Minnesota Transfer Railway, St. Paul, Minn. Meetings first Monday each month, except June, July and August, at Midway Club rooms, 1931 University avenue, St. Paul.

NORTHWEST LOCOMOTIVE ASSOCIATION. — G. T. Gardell, 820 Northern Pacific Building, St. Paul, Minn. Meetings third Monday of each month, except June, July and August.

PACIFIC RAILWAY CLUB. — William S. Wollner, P. O. Box A, Sausalito, Calif. Regular meetings, second Thursday of each alternate month at Palace Hotel, San Francisco, Calif., and Hotel Hayward, Los Angeles.

RAILWAY CLUB OF PITTSBURGH.—J. D. Conway, 308 Keenan Building, Pittsburgh, Pa. Regular meetings, fourth Thursday in month except June, July and August, Fort Pitt Hotel, Pittsburgh, Pa.

RAILWAY, FUEL AND TRAVELING ENGINEERS' ASSOCIATION.—T. Duff Smith, Room 811, Utilities Building, 327 South La Salle street, Chicago.

RAILWAY SUPPLY MANUFACTURERS' ASSOCIATION.—J. D. Conway, 308 Keenan Building, Pittsburgh, Pa.

SOUTHERN AND SOUTHWESTERN RAILWAY CLUB.—A. T. Miller, 4 Hunter St., S. E., Atlanta, Ga. Regular meetings, third Thursday in January, March, May, July and September. Annual meeting, third Thursday in November, Ansley Hotel, Atlanta, Ga.

TORONTO RAILWAY CLUB.—D. M. George, Box 8, Terminal A, Toronto, Ont. Meetings, fourth Monday of each month, except June, July, and August at Royal York Hotel, Toronto.

WESTERN RAILWAY CLUB.—E. E. Thulin, executive secretary, Suite 339, Hotel Sherman, Chicago. Regular meetings, third Monday in each month, except June, July, August, September, and January, Hotel Sherman, Chicago.

(*Turn to next left-hand page*)

AMERICAN EXPRESS TRAIN

Greetings of the Season

TO ALL
RAILROAD MEN

—who have shown that the Railroad
remains the nation's No. 1 carrier.

ASSOCIATION OF MANUFACTURERS OF CHILLED CAR WHEELS

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ORGANIZED TO ACHIEVE:
Uniform Specifications
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3413

NEWS

Pittsburgh Steel Opens Hollow Axle Plant at Allenport, Pa.

THE Pittsburgh Steel Company opened its recently completed plant for the manufacture of hollow railway car axles at its Allenport, Pa., works to the inspection of a party of railway officers and press representatives on November 4. The plant,

The axle is mechanically rotated while the journal and wheel seat are formed under the drop hammer—Upsetting press in background

which is laid out in a continuous production line in which most of the movement and furnace temperatures are automatically controlled, is designed to turn out an average of 500 axles per day.

The Urshel-Pittsburgh hollow car axle was adopted as an alternate standard by the Mechanical Division, A. A. R., in 1941 in sizes from 4¼ in. by 8 in. to 6½ in. by 12 in., inclusive. [A drawing of the axle and the report made on it at that time appeared on page 287 of the July, 1941, *Railway Mechanical Engineer*.] The raw material for the axle is a seamless steel tube formed by the forging process on a Pilger mill from a pierced cylindrical billet. The rolls used to form the tubing are elliptical and they rotate in a direction opposite to the feed of the steel which is pressed against the rolls by a ram. The steel is fed forward by the ram when the pass between the rolls is wide. As the pass narrows, the rolls produce an effect similar to the blows of a forging hammer. Inside tube diameter is maintained by the use of a mandrel.

The tubes, cut to length, are taken to the axle plant where they are heated for upsetting and forging, one end at a time, in a continuous open-side heating furnace. The walls of the heated end are then increased in thickness in an upsetting press and the ends shaped to form the journals and wheel seats by a 3,000-lb. drop hammer. Each tube is then returned on gravity rollers to the charging end of the heating furnace through which it is again passed for heating and forming the other end. The formed axles pass to a continuous hardening furnace from which they move to combined straightening rolls and water quenching tank in which the ends of the tubes are plugged automatically so that the quenching takes place on the outside only. The axle next goes through a continuous draw furnace from which it is again quenched. The ends are then simultaneously cut to length and centered.

The axles are designed to be machined to the same journal and wheel-seat dimensions as the conventional types of solid axles. They are completely interchangeable with solid axles and can be machined on the usual types of lathes adding suitable fittings for centering the tubular material.

Between the wheel seats the axles are straight and are left with the finish produced by the Pilger mill operation. The only difference in the outside dimensions is in the portion between the wheel seats, since the tubular axles do not have the fillet and the subsequent taper toward the center, which is typical of solid axles.

The axles were subjected to two types of tests. The first consisted of distortion or bending tests to determine stiffness under various loads. In these tests, collars were fitted on the wheel seats with the same tolerances with which wheel press fits are made. It was found that the deflection of tubular axles was less than that of solid axles under equivalent loads. In the solid axles, failure through permanent distortion began at 169,000 lb. and continued as the loads were increased. Actual yield occurred at 225,000 lb. to 226,000 lb.

For tubular axles, loads of 369,600 lb. to 431,000 lb. were required to set the structures permanently. This indicated 56 per cent greater strength for the tubular axles over the solid axles before plastic deformation developed.

Comparative fatigue tests were conducted at the Timken Roller Bearing Company's laboratory before the axle was adopted as an alternate standard. In these tests the tubular axle withstood 88,000,000 reversals

(*Continued on next left-hand page*)

A partial view of the hollow axle plant of the Pittsburgh Steel Company—To the rear of the upsetting press is the continuous tube end heating furnace—At the right foreground is the drop hammer which forms the journal and wheel seat

BUT WE DON'T THINK THEY DO, TODAY!

In the belief that no railroad could ever get more out of a locomotive than had been built into it by its maker, we have always insisted on the very highest standards in our design, our workmanship, and our selection of materials. We have carried our care in these regards to a degree which may have caused some to consider us over-careful—even 'fussy'.

But today, with war traffic stressing all rolling stock close to its limit of endurance, Lima-built locomotives are proving the value of Lima's unceasing search for perfection. Long are the miles and heavy the load, but Lima-built Modern Super-Power Steam Locomotives have what it takes to 'take it'—and they're proving this from coast to coast.

LIMA LOCOMOTIVE WORKS LIMA LOCOMOTIVE WORKS INCORPORATED INCORPORATED, LIMA, OHIO

of a unit stress of 19,000 lb. as compared with 875,000 to 2,755,000 stress reversals of the solid axles. Tests have also demonstrated the greater stiffness of the hollow axle under various loads and that it can be subjected to much higher loads before taking permanent set than can the solid axle. The 5-in. by 9-in. hollow axle weighs 177 lb. less and the 6½-in. by 12-in. axle 510 lb. less than the corresponding standard solid axles.

A.S.M.E. Honors Budd, Sillcox and Wright

THREE men well known in the railroad and railroad supply industries are among those upon whom honors were conferred at the annual meeting of the American Society of Mechanical Engineers held at the Pennsylvania Hotel, New York, November 29-December 3. The bestowal of honorary membership on Ralph Budd, president, Chicago, Burlington & Quincy, was made with the citation: "Forty years a railroader; a pioneer in the development of Diesel-powered lightweight trains; civil engineer and executive; builder of railroad structures and railroad organizations; president of the Burlington Lines." Roy V. Wright, editor of the *Railway Mechanical Engineer*, received honorary membership as an "International authority in railroad engineering oft-honored as author, editor, publisher, teacher, statesman, an amiable competent crusader for social and civic responsibilities of the engineer."

Lewis K. Sillcox, senior vice-president, New York Air Brake Company, received the A.S.M.E. Medal as an "Eminent engineer, executive, distinguished lecturer, beloved gentleman and a lover of wisdom, for his preeminent and permanent contributions to the art and science of engineering, of transportation, of education, and the fine art of living. And for his ingratiating, inspiring influence upon the lives of men." This medal is presented by the society "for distinguished service in engineering and science." It may also be awarded for general service in science having possible application in engineering.

Honorary membership, to which persons of acknowledged professional eminence are elected by unanimous vote of Council, was also bestowed upon Edward N. Trump, senior member in the firm of E. N. & C. C. Trump, Syracuse, N. Y.; and Francis B. Blossom, partner in the firm of Sanderson & Porter, New York.

The Worcester Reed Warner Medal, a gold medal bestowed on "the author of the most worthy paper received dealing with progressive ideas in mechanical engineering or efficiency in management," was presented to Igor Ivan Sikorsky, Vought-Sikorsky Aircraft, Stratford, Conn.

The Holley Medal, bestowed for "some great and unique act of genius of engineering nature that has accomplished a great and timely public benefit," was received by Vannevar Bush, president, Carnegie Institute of Washington, Washington, D. C.

The Charles T. Main Award, an annual cash award of $150 for "the best paper within the general subject of the influence of the profession upon public life," the exact topic being assigned by the Board of Honors and Awards, went to Mitchell C. Kazen of the University of Detroit, tool designer, Cook Engineering Company, Detroit, Mich.

Troels Warming, mechanical engineer, Nordberg Manufacturing Company, Milwaukee, Wis., received the Junior Award, an annual cash award of $50 presented for "the best paper or thesis submitted by a Junior Member."

William L. Hutton of Princeton University, Ensign, U.S.N.R., was presented with one of two Student Awards of $25 each established for "the best papers or theses submitted by Student Members" in undergraduate and post graduate work. Mr. Hutton is an undergraduate.

Lag in Fitting AB Brakes Is Cause of Admonition

THE concern of the Interstate Commerce Commission over the continued operation of large numbers of freight cars equipped with the type K brake has again been expressed, this time in a report, prepared under the direction of Commissioner Patterson, of the investigation of an accident on the Pennsylvania near Slope, Pa., on September 10.

The accident originated in the derailment on a descending grade of two cars of a 120-car train of empty tank cars and was complicated by the involvement of two other trains passing on parallel tracks which had been fouled by the derailed cars. The commission's investigation disclosed that only 10 of the 120 cars in the train were equipped with standard AB brakes, and that these cars were "distributed throughout the train so that important advantages of the AB type of brake equipment, namely, faster serial action, emergency after service and reduction of shock from initial application, were not available."

According to the report, the accident was caused by an "insufficient number" of cars being equipped with "adequate power brakes to control safely movement of the train." The report recommended "that a sufficient number of cars equipped with AB brakes be included in each train, properly spaced so that the movement of the train can be safely controlled by the train brakes."

No railroad-owned cars were included in the equipment of the derailed train. Ownership of the cars in the train was divided among 18 private car operators, and only 16.6 per cent of all cars of these 18 private car owners had been equipped with AB brakes up to June 30, the report pointed out, as compared with 60.6 per cent of all of the Pennsylvania's cars so equipped, although 85 per cent of the 10-year period allotted for application of the new standard brake had then elapsed.

Miscellaneous Publications

PIPE AND TUBE-BENDING HANDBOOK.—The Copper & Brass Research Association, 430 Lexington avenue, New York 17, has prepared an 80-page handbook on practical methods for bending pipe and tubes of copper, brass and related alloys. This work is divided into two classifications: (1) the routine bending of pipe and tube of relatively small diameter for a wide variety of commercial assemblies and installations, and (2) the specialty bending of large diameter tube for particular applications. The data and illustrations have been gathered from a variety of sources and, as nearly as practicable, where authoritative sources have been used, the full text of the original statements has been preserved. Twenty-four pages contain tabulated data on weights of seamless tubes of copper, brass and related alloys. There are several other pages of tables of standard pipe sizes; tables to determine sizes of Type K copper water tube for cold water service lines; flow through standard pipe size copper and brass pipe, etc.

A. A. R., Mechanical Division

LETTER BALLOT

CIRCULAR No. DV-1053, issued by the secretary, Mechanical Division, Association of American Railroads, on October 26, announces the results of the Letter Ballot on 14 propositions which, under authorization of the General Committee of that division, were submitted to letter ballot on September 8. All of the proposals were adopted by large majorities of the ballots cast. They were as follows: (1) to advance to standard the present optional tie bar construction between the top toes and the bottom toes of the brake head for the No. 15 brake beam; (2) to adopt as recommended practice a form of card for listing data with respect to HSC air-brake equipment on passenger cars, in lieu of stenciling each item; (3) to revise the standards for lettering and marking of cars to include requirements for marking of freight equipment cars that are leased or are in special service, to indicate the point to which the car is to be returned when empty; (4) to modify the fusion and bronze welding regulations with respect to building up eyes of brake-beam hangers; (5) to clarify the fusion and bronze welding regulations with respect to welding of cast-steel bolsters; (6) to modify the fusion and bronze welding regulations to prohibit welding parts of inadequate design or made of defective material; (7) to modify the standard location of angle cocks; (8) to adopt as standard, waste retainer ribs for passenger and freight journal boxes of Classes C, D, E and F; (9a) to adopt as recommended practice designs of boiler studs; (9b) to add material reference to drawing covering cylinder and valve-head studs shown on page F-12 of the A. A. R. Manual; (10) to adopt as recommended practice designs for locomotive sanding systems for various types of locomotives; (11) to adopt as recommended practice pedestal jaw openings required for friction bearing journal boxes for steam, electric and Diesel locomotives and tenders; (12a) to adopt as recommended practice bushings thicknesses in relation to crank-pin diameters for various types of bushings on main and side rod ends; (12b) to revise page F-10 of the A. A. R. Manual for the purpose of clarifying the stress limitations and provide a limit for reboring of rod ends;

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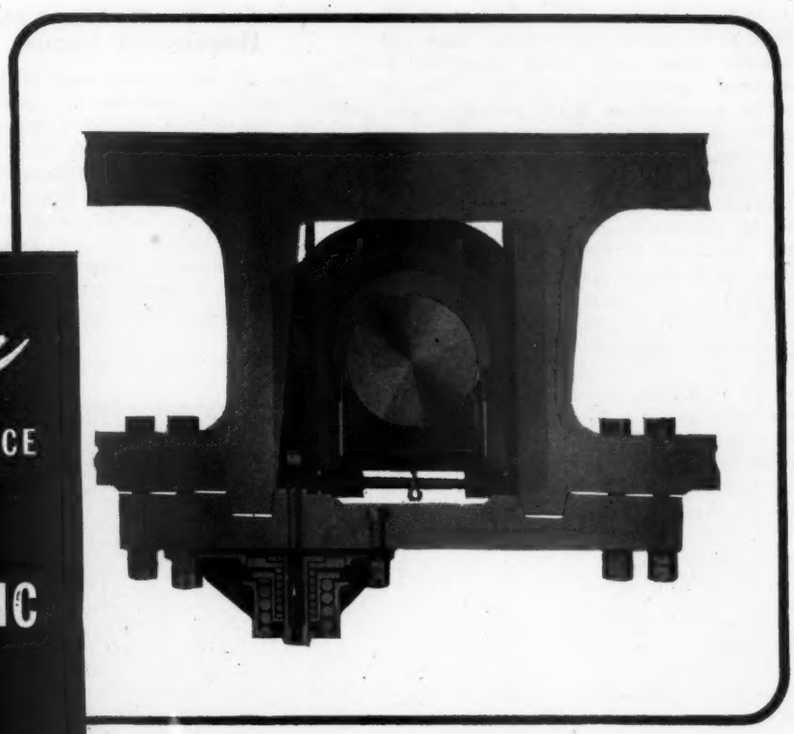


Save Manpower

INCREASE LOCOMOTIVE SERVICE

USE THE

FRANKLIN AUTOMATIC COMPENSATOR and SNUBBER

This important Franklin device releases manpower and increases the availability of your locomotives. Instead of calling for the services of scarce and more needed skilled maintenance men, it compensates *automatically* and *continuously* for all alterations caused by driving box temperature changes, and also dampens the stresses induced by reversal of forces.

By eliminating the air gap and by dampening stresses, the Franklin Automatic Compensator and Snubber greatly prolongs bearing life and increases locomotive mileage between shoppings. It has never been so important to keep every locomotive working to its utmost as it is today!

FRANKLIN RAILWAY SUPPLY COMPANY, INC.

NEW YORK CHICAGO

In Canada: FRANKLIN RAILWAY SUPPLY COMPANY, LIMITED, MONTREAL

(13) to revise page F-6A of the A. A. R. Manual to include sizes of dry pipes and outside steam pipes now appearing in material specifications M-108; (14) to revise specifications M-108 covering boiler tubes, to eliminate reference to dry pipes and steam pipes.

The first two propositions were recommended by the Committee on Brakes and Brake Equipment; Nos. 3 to 8 came from the Committee on Car Construction; Nos. 9 to 13, inclusive, were submitted by the Committee on Locomotive Construction, and No. 14 is the recommendation of the Committee on Specifications for Materials. With the exception of No. 11, the proposals all go into effect on January 1, 1944. Inclusion of No. 11 in the Manual of Standard and Recommended Practice is being held in abeyance pending further consideration by the Committee on Locomotive Construction.

Thickness of Journal-Bearing Lining Increased

By action of the Association of American Railroads, Mechanical Division, as announced in a circular letter issued by Secretary A. C. Browning, the A.A.R. emergency design of journal bearing has been modified by increasing the lining thickness from the present nominal of ⅛ in. to a new nominal of ¼ in., maintaining the same tolerances for H and P dimensions as heretofore (plus or minus 1/32 in.).

A revised drawing, which accompanied the letter, is supplied to supersede the present emergency design drawing in the Manual of Standard and Recommended Practice. Table II of the specifications for relined journal bearings has been revised as shown in the accompanying table.

Crown Thickness of Relined Bearings—Finished Dimensions After Broaching

Journal size, in.	Total thickness, in.
3¼ by 7	15/16
4¼ by 8	15/16
5 by 9	13/16
5½ by 10	13/16
6 by 11	13/16
6½ by 12	15/16
Tolerances	Plus or minus 1/64 in., all sizes

Canadian Pacific Apprentices Honored at Angus

Prizes for outstanding work during the past year were awarded 23 apprentices at the Angus shops of the Canadian Pacific at Montreal, Que., on October 22. Ten of the winners were "repeaters" who had won prizes in one or more previous competitions. The ceremony at Angus was the first of a series which will take place in the Ogden shops at Calgary, Alta., where naval guns are being made; in the Weston shops at Winnipeg, Man., and in the various back shops.

The training course covers a period of five years, during which time there is a weekly school period eight months each year. The apprentices are transferred from main to back shops and vice-versa to round out their education in the 25 different crafts they learn as machinists, boilermakers, blacksmiths, sheet-metal workers, electricians, painters and carmen. Work on tanks, guns and munitions is also a part of the training.

H. B. Bowen, chief of motive power and rolling stock, is in charge of the apprentice system in which 500 are enrolled.

Some of the winners in the twenty-third annual scholarship competition of the Canadian Pacific apprentice system at Angus shops

Left to right, *back row:* W. Rezanowich, J. P. Rivet, J. Thibodeau, R. Dubois, C. Dupont, R. D'Amour.—*Middle row:* T. Betuik, M. Alexandre, F. Parrett, V. Mandeville, F. W. Thoburn, J. Dzamka, J. P. Lessard, R. Mouton.—*Front row:* R. Lucciasano, Charles Bulley, (classroom instructor), B. Faughnan (assistant works manager, car), D. L. Thornton (assistant works manager, locomotive), H. R. Naylor (works manager), T. F. Donald (assistant works manager, munitions), Hugh Shea (shops instructor), and L. Huneault.

"Welding Stainless Steel," an Allegheny-Ludlum Film

A 16 m.m. full-color sound film, "Welding Stainless Steel," has recently been completed by the Allegheny-Ludlum Steel Corporation, Brackenridge, Pa. The purpose of the film is to serve as an aid in teaching welding students, as well as welders familiar with carbon-steel welding, the fundamentals of working with stainless steels. The process is explained in simple terms, and close-ups of the arc at work greatly magnify the action of the protective flux and the melting of the rod metal.

Supply Trade Notes

Standard Stoker Company.—*J. B. MacKenzie,* formerly development engineer, has been appointed mechanical engineer, and *E. F. Seibel,* formerly chief draftsman, has been appointed assistant mechanical engineer of the Standard Stoker Company, with headquarters at Erie, Pa.

◆

Westinghouse Electric & Manufacturing Co.—*Peter L. Lenz,* formerly manager of the Pittsburgh, Pa., homewood manufacturing and repair plant of the Westinghouse Electric & Manufacturing Co., has been appointed manager of the Middle Atlantic district manufacturing and repair department with headquarters in Philadelphia, Pa. His new duties will include general supervision of two manufacturing and repair plants in Philadelphia and one each in Wilkes-Barre, Pa., Huntington, W. Va., and Baltimore, Md.

◆

Gustin-Bacon Manufacturing Company.—*J. F. Stephens,* general manager of the industrial department of the Gustin-Bacon Manufacturing Company, has been elected a vice-president of the company.

◆

United States Electrical Tool Company.—*Joseph D. O'Flaherty* has been appointed assistant manager in charge of sales and promotion for the United States Electrical Tool Company, Cincinnati, Ohio. He was formerly branch manager of the Schacht Motor Company, Columbus, Ohio, and for 13 years was sales manager of the Diamond-T Truck Company of Cincinnati. *Al. H. Kohnen,* formerly associated with the Estate Stove Company, Hamilton, Ohio, has been placed in charge of the company's Pittsburgh, Pa., office.

◆

Baldwin Locomotive Works.—*John C. Graf* has been appointed sales manager of the hydraulic press and special equipment department of the Southwark division of the Baldwin Locomotive Works. Following his graduation from Temple University, Mr. Graf was associated for two years with the Link Belt Company and later with the

(*Continued on next left-hand page*)

SECURITY

CIRCULATORS

- for increased locomotive availability
- for better Arch Brick support
- for Positive Flow of Water over CENTER of Crown Sheet
- for Reduced Honeycombing • for Reduced Flue Plugging
- for Reduced Cinder Cutting

AMERICAN ARCH COMPANY, INC.

60 East 42nd Street, New York 17, N. Y.

SECURITY CIRCULATOR DIVISION

Camden Iron Works of R. D. Wood & Company. He joined the Southwark Foundry & Machine Co., now the Baldwin Southwark division, in 1915, serving as draftsman, expediter, inspector, purchasing agent and salesman and was appointed New England sales manager in 1925, the position he held prior to his new appointment.

◆

CARNEGIE-ILLINOIS STEEL CORPORATION.—*J. M. Darbaker,* general superintendent of the Carnegie-Illinois Steel Corporation, Chicago, has been promoted to assistant manager of Chicago district operations to succeed *R. G. Glass,* who was elected vice-president and general manager of the Geneva Steel Company, Provo, Utah.

◆

AMERICAN CAR AND FOUNDRY COMPANY.—*William L. Stancliffe,* vice-president in charge of miscellaneous sales and munitions, has been appointed vice-president in charge of sales of the American Car and Foundry Company, to succeed the late *William E. Hedgcock.* He will continue to handle contractual relations between the company and the U. S. government having to do with the manufacture and sale of munitions of war. Mr. Stancliffe's early business training began with contracting engineers, and he took

William L. Stancliffe

part in the construction of many well-known projects including the College of the City of New York and the Hell Gate Bridge. He later joined the Traylor Engineering & Manufacturing Co., serving as a member of the sales staff for a number of years. When the American Car & Foundry Motors Co. was formed in February, 1926, Mr. Stancliffe became its vice-president in charge of motor coach sales. He was transferred to the operating department of the American Car and Foundry Company in February, 1932, and appointed manager of miscellaneous sales in March, 1939. He subsequently was elected vice-president in charge of miscellaneous sales and munitions.

◆

HOUDAILLE-HERSHEY CORPORATION.—*Alfred C. Ryan,* former member of the executive staff of the Universal Credit Company who has been serving with the War Production Board since November, 1942, has been appointed director of sales of the Houde engineering division of the Houdaille-Hershey Corporation.

AMERICAN ARCH COMPANY.—*J. D. Brandon* has been named vice-president in charge of sales of the American Arch Company, with offices in New York and Chicago. Mr. Brandon began his career with the New York Central in 1906, serving his apprenticeship at the railroad's Beech Grove, Ind., shops. He was foreman and general fore-

J. D. Brandon

man of the Urbana, Ill., enginehouse of the Peoria & Eastern from 1912 to 1915 and general foreman of the American Brake Shoe & Foundry Company from 1915 to 1919. He joined the American Arch Company in 1919, leaving in 1924 to become associated with the Pittsburgh Steel Products Company. In 1927 he rejoined American Arch as assistant to the executive vice-pres.

◆

HANDY & HARMAN.—*John B. Ross,* formerly with Linde Air Products Company has been appointed to the West Coast engineering office of Handy & Harman. Mr. Ross will serve West Coast industries and shipyards in the capacity of brazing engineer in the application of Handy & Harman's silver brazing alloys and other precious metal products. Mr. Ross is a graduate of the University of California where he was employed for some time on advisory work. Following this, he went with a large Western oil company and finally became associated with the gas consuming apparatus field which he has served since 1925. In his new appointment, Mr. Ross will make his headquarters at the Los Angeles, Calif., office of Handy & Harman which serves California, Washington and Oregon.

Army-Navy "E" Awards

Bullard Company, Bridgeport, Conn. Third. award.

Davenport Besler Corporation, Davenport, Iowa. November 3.

Fitzgibbons Boiler Company, Oswego, N. Y. October 29.

Hazard Insulated Wire Works, a division of the Okonite Company.

Link-Belt Company, Chicago. October 7.

Philco Corporation, Trenton, N. J. Second award.

Whiting Corporation, Harvey, Ill. Second award.

AMERICAN LOCOMOTIVE COMPANY.—*Robert B. McColl,* vice-president in charge of manufacturing of the American Locomotive Company, has been elected a director.

◆

ALLEGHENY LUDLUM STEEL CORPORATION.—The Allegheny Ludlum Steel Corporation, Brackenridge, Pa., has announced the acquisition of the Carbide Alloy Corporation of New York, which will be operated as Allegheny Ludlum's Carbide division.

◆

DAVIS BRAKE BEAM COMPANY.—*George W. Fox,* formerly secretary, has been elected president of the Davis Brake Beam Company, Johnstown, Pa. *David E. Shannon* has been elected vice-president and *O. G. Custer,* assistant secretary.

◆

ELASTIC STOP NUT CORPORATION.—*Luther H. Atkinson* has been appointed vice-president in charge of sales of the Elastic Stop Nut Corporation. Mr. Atkinson was formerly vice-president in charge of marketing for the Weyerhaeuser Sales Company, St. Paul, Minn.

◆

GOULD STORAGE BATTERY CORPORATION.—*W. H. Radeke* has been appointed service manager of the Gould Storage Battery Corporation at Depew, N. Y. Mr. Radeke has been a Gould service engineer in the Chicago area for the past seven years. For seventeen years prior to that he was active in the public utility field, specializing in

W. H. Radeke

lead acid storage service. During World War I, Mr. Radeke was in the United States Naval Electrical School Submarine Base, New London, Conn. After finishing the course, he was transferred to duty in the Submarine Base, San Pedro, Calif. Because of this wide experience in submarine storage battery operations, he will in the future personally contact east coast naval bases for installation work and service on Gould batteries in use by the Navy.

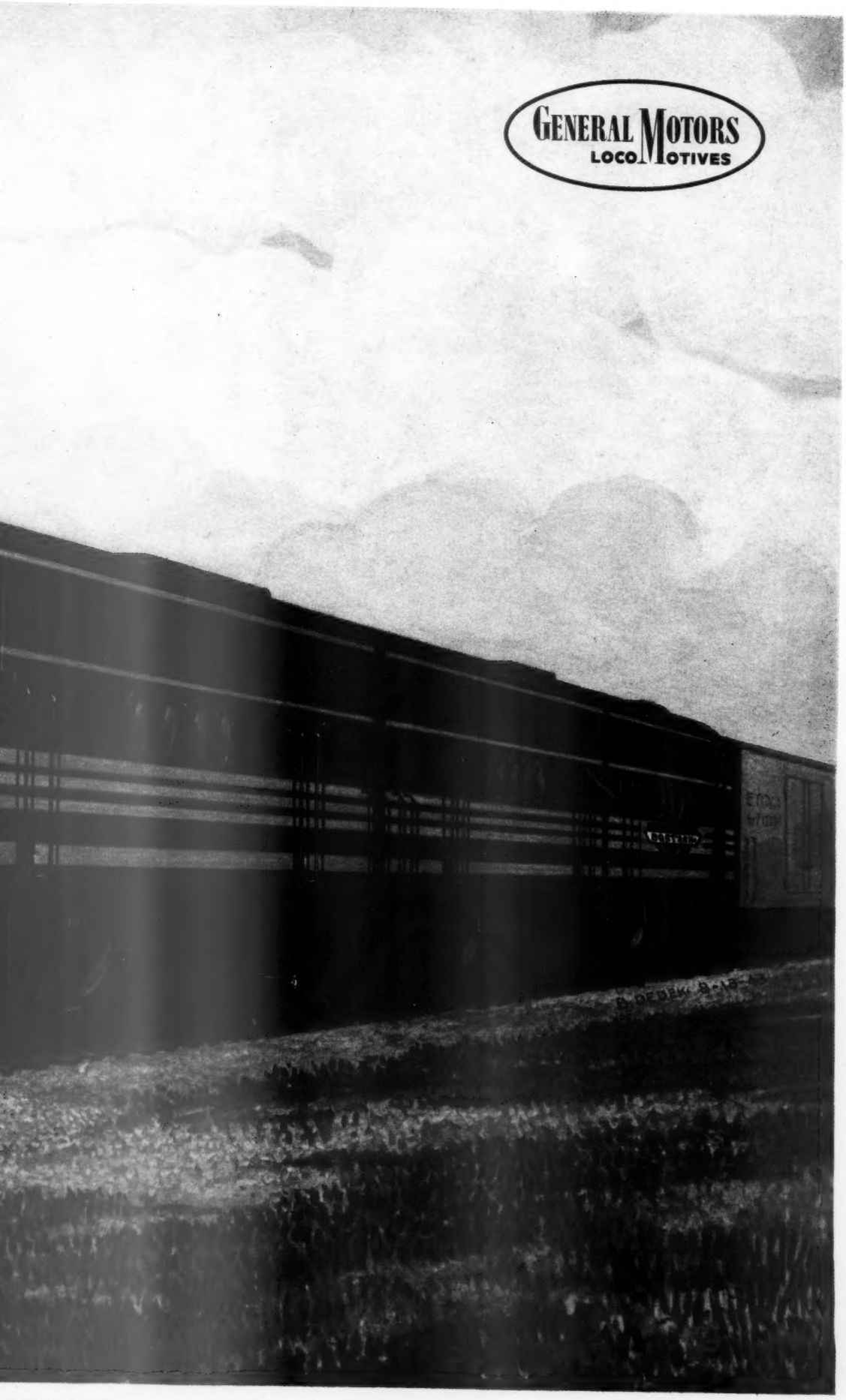
◆

AMERICAN BRAKE SHOE COMPANY.—*Joseph B. Terbell* has been appointed first vice-president of the American Manganese Steel division of the American Brake Shoe Company. Mr. Terbell was graduated from

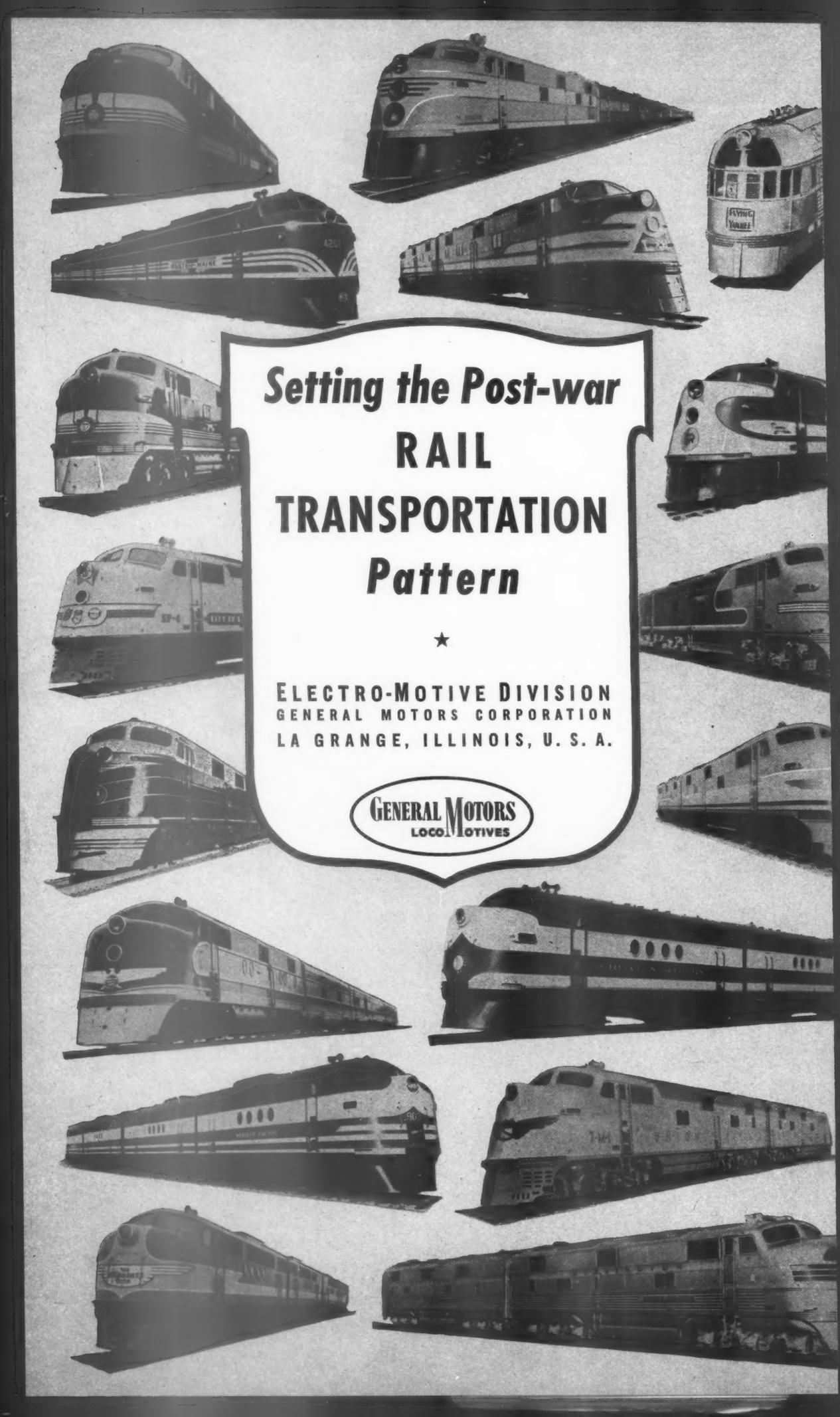
(*Continued on fourth right-hand page*)

5400 H.P. DIESEL FREIGHT LOCOMOTIVE · · · DESIGNE

D AND BUILT BY ELECTRO-MOTIVE DIVISION · · · GENERAL MOTORS CORPORATIO



ORATION · · · LA GRANGE, ILLINOIS, U. S. A.



Setting the Post-war

RAIL TRANSPORTATION *Pattern*

★

ELECTRO-MOTIVE DIVISION
GENERAL MOTORS CORPORATION
LA GRANGE, ILLINOIS, U. S. A.

GENERAL MOTORS LOCOMOTIVES

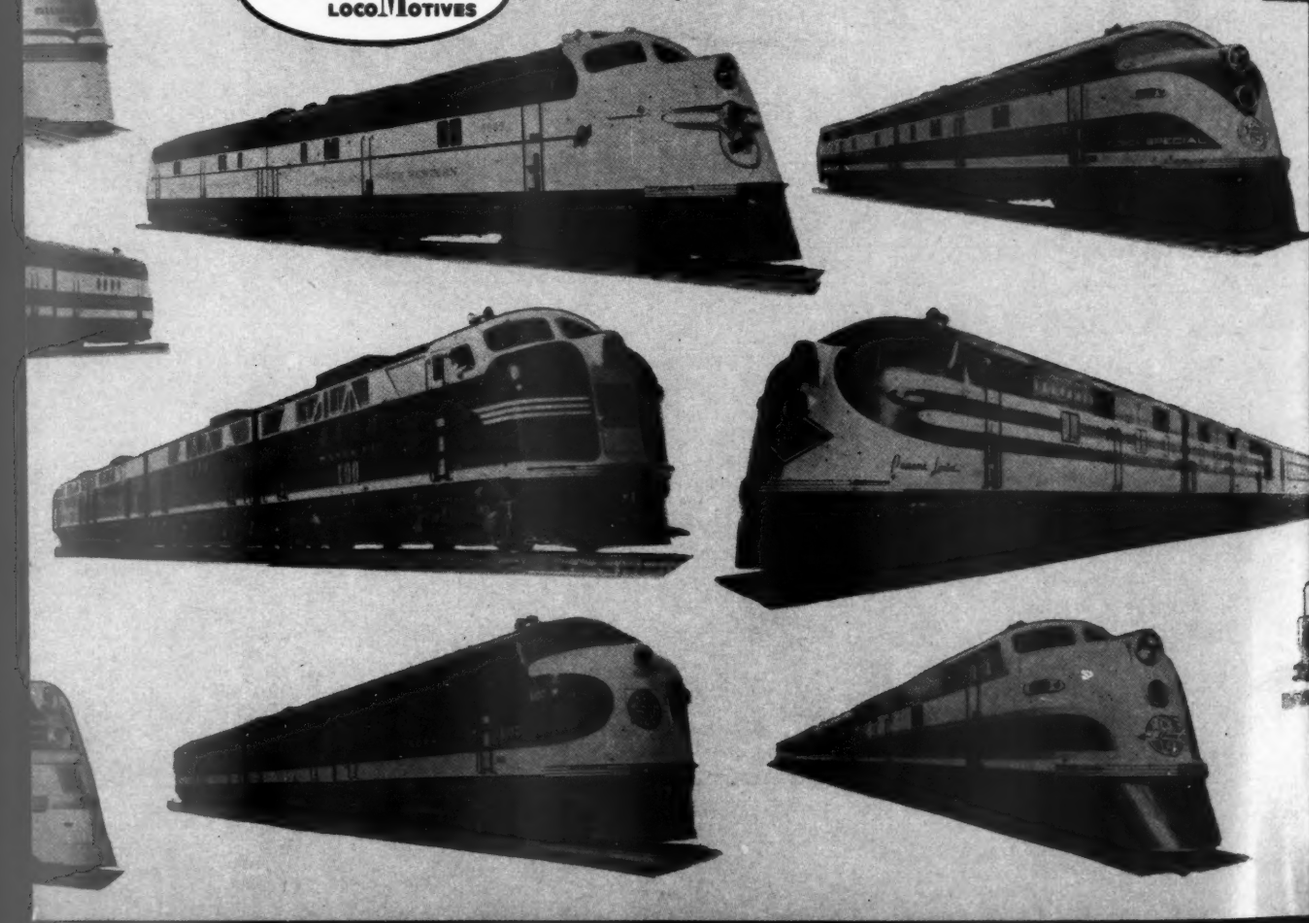
Mainline Operation

Farsighted operating officials continue to order Diesel locomotives to rehabilitate war worn motive power pools, in preparation for the heavy post-war job. For the unprecedented loads of wartime have thrown the advantages of General Motors Diesel Locomotives into high relief, such advantages as:

Power for hauling greater tonnage and reducing or eliminating helper service...
Speed for faster schedules...
Flexibility for meeting varying traffic conditions...
High availability with minimum "time-outs" for servicing and repairs...
Economy in lower fuel costs, elimination of expensive supporting services, lower track maintenance, fewer fuel and water stops which speeds up schedules, smoother starts and stops resulting in greater protection to cars and lading and greater comfort to passengers...

GM Diesel Power has very definitely proved its superiority in all classes of service. The full potential savings which follow the complete Dieselization of an entire railroad, or section of railroad, can now be realized. Expensive supporting services which are not required for Diesel operation can now be gradually reduced and finally eliminated — damage and repairs to track and bridge structures will be materially reduced—and fewer locomotives will be required to meet the heavy traffic demands of the post-war era.

GENERAL MOTORS
LOCOMOTIVES



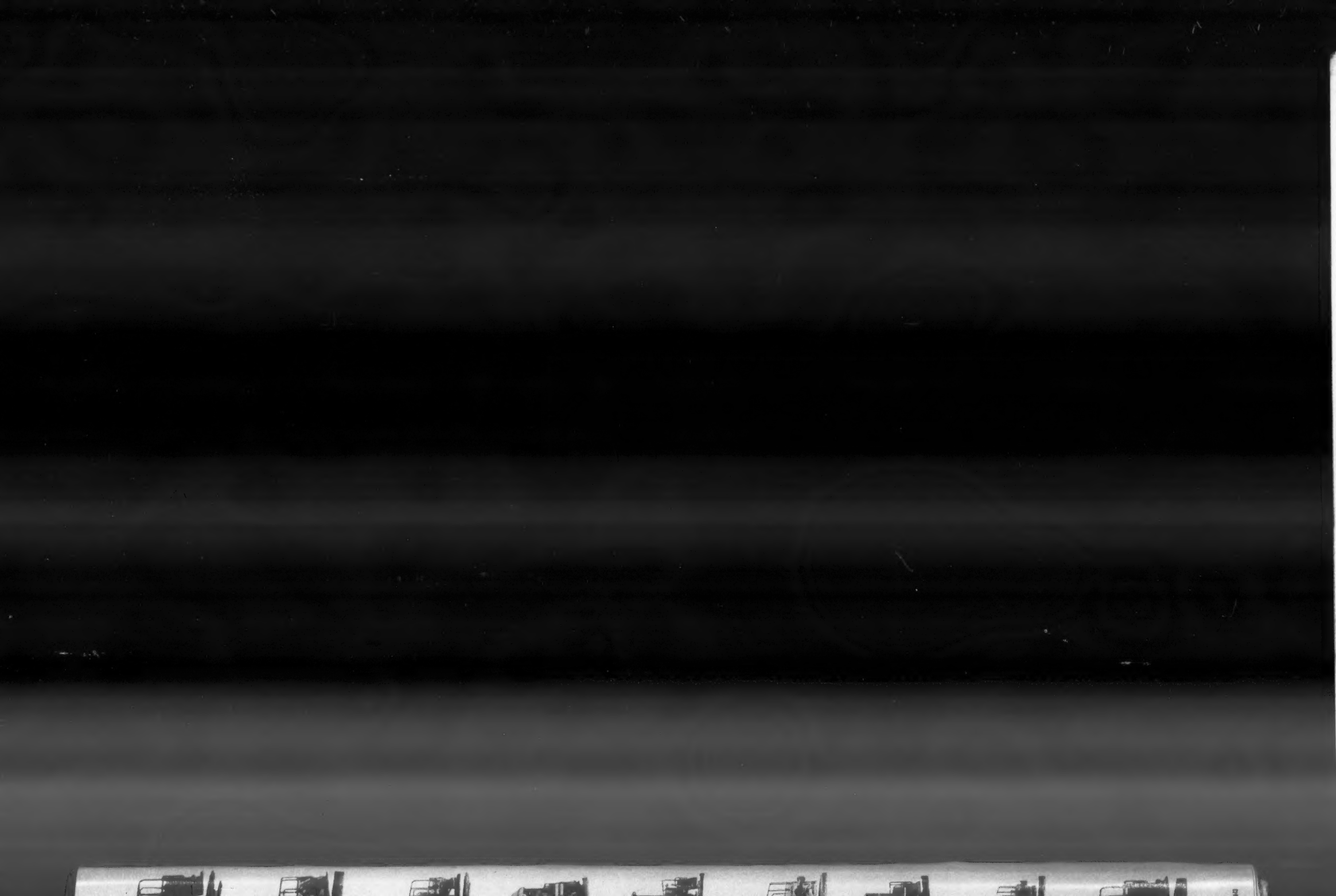
In Yards and Terminals

Time and tonnage gains in mainline operations can be quickly nullified by congestions in yards and terminals. GM Diesel switchers, with their proved ability to keep yards clear with no "bottlenecks", and with outstanding economies, become the perfect complement to GM Diesel road power. Designed for smooth starting and stopping, GM Diesel switchers provide maximum protection to equipment and lading and comfort to passengers.

ELECTRO-MOTIVE DIVISION
GENERAL MOTORS CORPORATION
LA GRANGE, ILLINOIS, U. S. A.

GENERAL MOTORS LOCOMOTIVES

RAILWAY AGE, NOV. 20, 1943
RAILWAY MECHANICAL ENGINEER, DEC., 1943



the Sheffield Scientific School of Yale University in 1928, and joined the American Manganese Steel division in October of that year. After serving an apprenticeship of about two years in the company's Chicago Heights plant, he entered the Chicago

Joseph B. Terbell

sales office. He was transferred to the Ramapo-Ajax division in 1931, and to the American Manganese Steel division's New York office in 1932. He moved to St. Louis, Mo., as assistant manager of the alloy department in 1933, and to the sales department in Chicago in 1935. He was transferred to the American Forge division in 1936, returning to Amsco in 1937 as eastern sales manager in the New York office. Mr. Terbell was appointed a vice-president of the Steel division in 1940.

◆

FITZGIBBONS BOILER COMPANY.—The Fitzgibbons Boiler Company is converting its plant at Oswego, N. Y., to the production of boilers for locomotives.

Obituary

WALTER H. HINSCH, chief engineer of the Dearborn Chemical Company, Chicago, who was granted a leave of absence on January 1, 1942, to serve as lieutenant colonel of the 267th Field Artillery, was killed at Camp Van Dorn, Miss., on November 15 during maneuvers with live ammunition.

◆

WILLIAM E. HEDGCOCK, vice-president in charge of sales of the American Car and Foundry Company and former purchasing agent for that company, who died October 26 in New York, as announced in the November issue, was 76 years of age. He had been associated with the American Car and Foundry Company and its predecessor companies for more than 60 years. He was born in Jeffersonville, Ind., and, at the age of 14, joined the Ohio Falls Car Manufacturing Company where he was employed in various capacities and finally as supply agent. When that company became part of the American Car and Foundry group in 1899 Mr. Hedgcock was transferred to the purchasing department at St. Louis, Mo. He subsequently became purchasing agent at St. Louis and in 1918 was transferred to New York. He was elected assistant vice-president in charge of sales in 1923 and was placed in charge of the eastern sales district in 1925. He became acting head of the

William E. Hedgcock

sales department in 1940 and was appointed vice-president in charge of sales in January, 1941. Mr. Hedgcock was vice-president of the American Railway Car Institute and a director of American Car and Foundry Securities Corp. and the American Car and Foundry Export Co.

Personal Mention

General

GUY M. GRAY, superintendent of motive power of the Bessemer & Lake Erie with headquarters at Pittsburgh, Pa., has resigned from this position after more than 47 years of service with the company.

EDWIN F. RICHARDSON, assistant superintendent of motive power of the Bessemer & Lake Erie has been appointed superintendent of motive power, with headquarters at Pittsburgh, Pa.

ALAN BEARDSHAW, who has been appointed general superintendent of motive power and car equipment of the Western Region of the Canadian National at Winnipeg, Man., as announced in the October issue, was born in Lewisham, England, on June 27, 1891, and entered railway service on the Grand Trunk (now part of Canadian National) at Toronto in November, 1912, later being transferred successively to Sarnia, Ont., Regina, Sask., Mimico, Ont., and Richmond, Que., where in 1915, he became locomotive foreman. He served with the Royal Navy from 1916 to 1919 and then returned to the C. N. R. as assistant foreman at Turcot, Que., becoming locomotive foreman shortly afterward. In January, 1935, Mr. Beardshaw was appointed superintendent of motive power and car equipment at Toronto.

F. O. YOUNG, chief draftsman of the Northern Pacific at St. Paul, Minn., has been promoted to mechanical engineer, with headquarters at St. Paul.

LEWIS S. BILLAU, who has been appointed electrical engineer of the Baltimore & Ohio, with headquarters at Baltimore, Md., as noted in the November issue, was born in Cedar Rapids, Iowa, in 1884. He attended the University of Minnesota where he received his degree in electrical engineering in 1905. His first employment was in the test department of the General Electric Company at Schenectady, N. Y., where he specialized in the field of heavy electric traction. Mr. Billau entered the employ of the B. & O. in 1908 as an inspector in the electrical department; became assistant engineer in 1909; chief draftsman in 1910, and assistant electrical engineer in March, 1914. Mr. Billau holds a life membership in the American Institute of Electrical Engineers. He is also a member of the committee of direction, electrical section, Mechanical Division and a member of the Electrical Section, Engineering Division, Association of American Railroads.

Lewis S. Billau

J. W. HAWTHORNE, has been appointed assistant superintendent of motive power of the Central of Georgia, with headquarters at Savannah, Ga. Mr. Hawthorne, who was previously in the employ of the New York Air Brake Company, is a graduate of Purdue University where he specialized in locomotive and car design, receiving the degree of B.S. M.E. in 1933. From July, 1933, until July, 1936, he was employed at the Watertown, N. Y., plant of the New York Air Brake Company. During the latter year he was transferred to Cleveland, Ohio, as service representative. From January, 1940, until July, 1940, he was on leave and was air-brake instructor on the Chesapeake & Ohio at Richmond, Va.

WILLIAM MOORE, who has been appointed superintendent of motive power of the Erie, with headquarters at Cleveland, Ohio, as noted in the November issue, was born at Hornell, N. Y., and attended Park, Institute, Pittsburgh, Pa. In 1906 he became a foreman of the Erie at Meadville, Pa., and three years later enginehouse foreman, with headquarters at Carbondale, Pa. From 1915

William Moore

to 1917 Mr. Moore served as general foreman at Marion, Ohio, and Meadville, and in 1918 he was promoted to the position of master mechanic, with headquarters at Kent, Ohio. In 1921 he was transferred to Susquehanna, Pa., and in 1938 to Buffalo, N. Y. In 1941 he was appointed assistant to the superintendent of motive power, with headquarters at Cleveland. Mr. Moore is a past president of the Central Railway Club, Buffalo.

WILLIAM A. CARLSON, western district manager of the Erie at Meadville, Pa., has been appointed assistant superintendent of motive power with headquarters at Cleveland, Ohio. Mr. Carlson was born at Chi-

William A. Carlson

cago on April 27, 1890, and entered railway service in June, 1906, as a machinist helper of the New York, Chicago & St. Louis (Nickel Plate), at Chicago, subsequently serving as a machinist at Fort Wayne, Ind. In 1913 he went with the Chicago & Alton (now the Alton) as a machinist at Chicago, and one year later he went with the Chicago, Rock Island & Pacific, in the same capacity and with the same headquarters. In July, 1915, Mr. Carlson returned to the Nickel Plate as a machinist and later served as roundhouse foreman and general foreman at Fort Wayne. In 1928 he became general master mechanic of the Erie at Hornell, N. Y., and in 1929 he was advanced to Western district master mechanic, with headquarters at Meadville, Pa., holding that position until his new appointment.

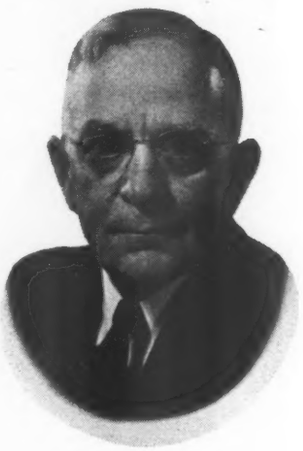
EDWIN F. RICHARDSON, assistant superintendent of motive power of the Bessemer & Lake Erie at Greenville, Pa., has been appointed superintendent of motive power, with headquarters at Greenville. Mr. Richardson was born at Shenango, Pa., on Sep-

Edwin F. Richardson

tember 13, 1880. He entered railroad service on June 1, 1899, as a special apprentice of the Bessemer & Lake Erie. He then served successively as air-brake inspector and air-brake instructor until 1918, when he became assistant to the engineer motive power. Mr. Richardson was appointed assistant engineer motive power in November, 1936, and assistant superintendent motive power in May, 1939.

W. E. BARNES, who has retired as general superintendent of motive power and car equipment of the Atlantic Region of the Canadian National as noted in the October issue, was born on July 24, 1877, at Shediac, Westmoreland county, N. B. He entered railroad service on April 20, 1899, as an apprentice draftsman of the Intercolonial (now Canadian National), later serving a special machinist apprenticeship until 1906, when he became a machinist of the Canadian National. In April, 1910, he became locomotive and enginehouse inspector; in January, 1911, acting master mechanic; on September 1, 1912, master mechanic and in February, 1918, general master mechanic. Mr. Barnes was appointed superintendent of motive power in March, 1923; general superintendent of motive power on January 1, 1928, and general superintendent motive power and car equipment at Moncton, N. B., on August 1, 1932.

T. F. POWERS, who has been appointed chief mechanical officer of the Chicago & North Western as noted in November, was born at Winona, Minn., on October 2, 1882, and entered railway service on May 1, 1899, as a water boy, bridge and building department of the North Western at Winona. Two years later he began serving his apprenticeship as a mechanic in the locomotive shops at Winona and in 1906 became a mechanic. In 1907 Mr.



Thomas F. Powers

Powers became a mechanic in the employ of the Duluth, South Shore & Atlantic at Marquette, Mich., and in July, 1908, he returned to the North Western, being promoted to the position of foreman at Chadron, Neb., one year later. In 1926 he was appointed assistant superintendent of motive power and machinery, Northern district, and in December, 1941, superintendent of motive power, Northern district.

R. W. KELLER, who has been appointed electrical engineer of the Central of New Jersey, with headquarters at Jersey City, N. J., as noted in the November issue, entered railroad service in 1913 as an elec-

R. W. Keller

trician in the employ of the Central of New Jersey, and was assigned to a construction gang on wiring stations and engine terminals, and construction work in general. In 1916 he was promoted to fore-

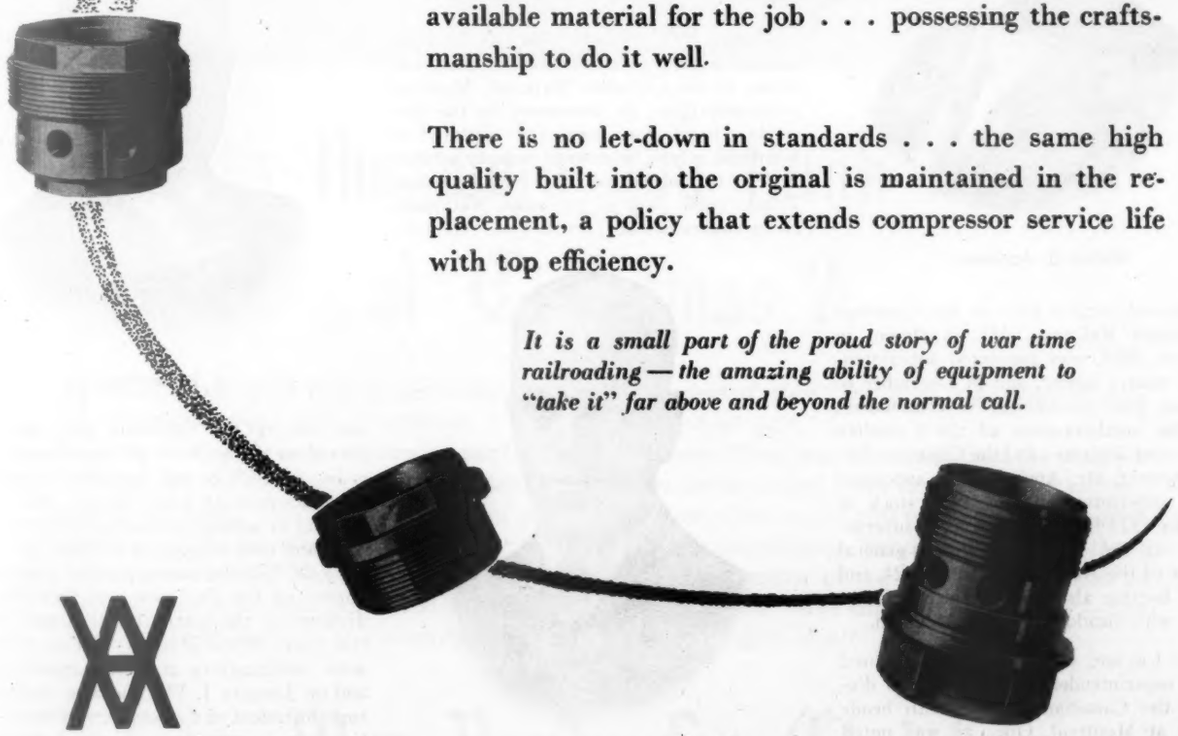
(Continued on next left-hand page)

High Standards Maintained for Compressor Replacement Parts

Our "know-how" of air compressor replacement parts has a background of three generations . . . knowing the best available material for the job . . . possessing the craftsmanship to do it well.

There is no let-down in standards . . . the same high quality built into the original is maintained in the replacement, a policy that extends compressor service life with top efficiency.

It is a small part of the proud story of war time railroading — the amazing ability of equipment to "take it" far above and beyond the normal call.



WESTINGHOUSE AIR BRAKE CO.

WILMERDING, PENNSYLVANIA

man with headquarters at Jersey City, handling maintenance and construction in that area. In 1926 he became general foreman, handling locomotive lighting, train control, car lighting, and air conditioning as well as maintenance and construction. He was appointed supervisor in charge of electrical matters in 1935.

JOHN R. FINNERTY, road foreman of engines of the Scranton division, Delaware, Lackawanna & Western, has been appointed rules examiner with headquarters at Scranton, Pa.

WALTER U. APPLETON, vice-president of the Atlantic region of the Canadian National at Moncton, N. B., has retired. Mr. Appleton was born at Moncton on January 29, 1878, entering the service of the Intercolonial (now Canadian National) as a junior clerk in October, 1890. Until October, 1913, he served successively as machinist apprentice, machinist, chief clerk, assistant to the superintendent of motive power and as general master mechanic. When the

Walter U. Appleton

Intercolonial became part of the Canadian Government Railways, Mr. Appleton, in February, 1918, was appointed superintendent of motive power, and in December of the same year mechanical superintendent. With the amalgamation of the Canadian Government Railways and the Canadian National System, Mr. Appleton was appointed general superintendent of rolling stock in 1920. In 1923 he became general superintendent of the Atlantic region; general manager of the Atlantic region in 1924, and in 1935 became also vice-president of that region, with headquarters at Moncton.

N. R. CRUMP, who has been appointed general superintendent of the Ontario district of the Canadian Pacific, with headquarters at Montreal, Que., as was noted in the November issue, was born on July 30, 1904, at Revelstoke, B. C., and received his B.S. and M.E. degrees from Purdue University, Lafayette, Ind. He entered railroad service in 1920 as a machinist apprentice of the Canadian Pacific at Field, B. C., transferring to the Weston shops at Winnipeg, Man., in 1922. He then attended Purdue from 1925 to 1929, after which he returned to Winnipeg as a machinist. In 1930 Mr. Crump became night foreman at Sutherland, Sask., subsequently becoming shop foreman, first at Lethbridge, Alta., and then at Calgary, Alta. He also

N. R. Crump

served successively as locomotive foreman at Wilkie, Sask., night foreman at Moose Jaw, Sask., and division master mechanic at Moose Jaw, and in 1936 was transferred to Regina, Sask. He was appointed chief mechanical draftsman, Western lines, at Winnipeg in 1939, assistant superintendent of motive power for Western Canada in 1940, and assistant to the vice-president in 1942.

ALBERT E. COLEMAN, who has been appointed assistant superintendent of motive power of the Canadian National, Montreal terminals, Que., as announced in the November issue, was born and educated at Montreal, where he entered railway service. In 1919 he entered the service of the Grand Trunk (now part of Canadian National), as an electrician at Turcot, Que. He later

A. E. Coleman

worked in the Montreal motive power and car shops, and was transferred to Toronto, Ont., in 1923, becoming supervisor of unit cars in 1925. He was appointed electrical superintendent of the St. Clair Tunnel in 1940.

JOHN KYLE, who has retired as general superintendent of motive power and car equipment of the Western Region of the Canadian National as noted in the October issue, was born in Toronto on April 11, 1878, and entered railway service as a mechanical apprentice on the Grand Trunk (now part of the Canadian National) in 1893. In 1899 he went with the Canadian Pacific at Winnipeg and in 1903 was appointed general foreman of the Canadian Northern (now part of the Canadian National), later becoming assistant master mechanic. In 1907 he was transferred to Edmonton, Alta., and in 1912 was promoted to the position of master mechanic at Edmonton. Mr. Kyle was appointed superintendent of motive power and car equipment at Edmonton in 1923 and general superintendent of motive power and car equipment of the Western region at Winnipeg in 1932.

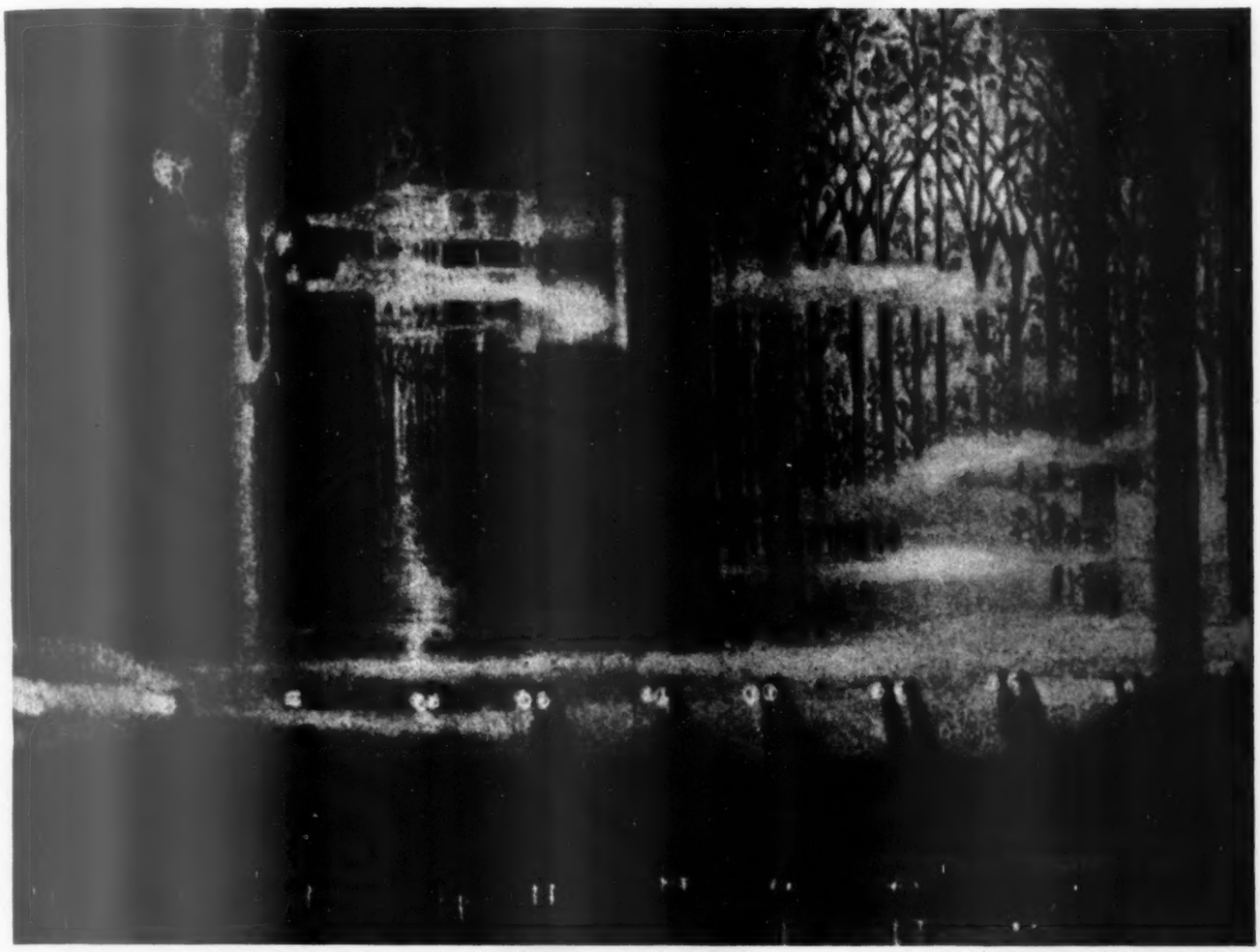
J. E. GOODWIN, who has been appointed assistant chief mechanical officer, system, of the Chicago & North Western, with headquarters at Chicago, as noted in November, entered railway service as a machinist apprentice in the employ of the Atchison, Topeka & Santa Fe in 1917, and after completing his apprenticeship, resigned to enter college, studying engineering at Wake Forest College and the University of Chicago. He reentered railroad service in 1925 as a machinist of the Missouri Pacific at Hoisington, Kan.,

J. E. Goodwin

and during the following year was promoted to the position of enginehouse foreman. In 1929 he was appointed foreman of the backshop at Little Rock, Ark., later serving as acting superintendent for a short time and then as general foreman. On January 28, 1941 he was appointed master mechanic of the Palestine and San Antonio division of the International-Great Northern (part of the Missouri Pacific system), with headquarters at San Antonio, Tex., and on January 1, 1942, became mechanical superintendent of the Southern district. Mr. Goodwin is president of the Locomotive Maintenance Officers' Association.

BLAIR L. THOMPSON, who has been appointed mechanical inspector of the Canadian National with headquarters at Montreal, Que., as noted in the October issue, was born on July 20, 1906, at Moncton,

(*Continued on next left-hand page*)



©Walt Disney Productions

What's the word you think most of at Christmas?

THERE'S one word men of good will everywhere associate with Christmas.

That word is *"Peace. Peace on earth"*...

There can be no peace this Christmas. Not one of us would want the only kind of peace there could be, an inconclusive peace.

But we do want the right kind of peace as soon as possible. And this Christmas we can help hasten the coming of that wonderful day, by making War Bonds our chief gift.

Every Bond you buy brightens the chances of a better world than man has ever known.

How, then, could you possibly give a better present than Bonds, Bonds, Bonds? Give them to each member of the family. Give them to your friends. Give them to *everybody—the greatest gift of all!*

Alco Give War Bonds for Christmas

AMERICAN LOCOMOTIVE COMPANY

This advertisement prepared under the auspices of the U. S. Treasury Department and the War Advertising Council.

N. B. He attended Moncton City schools and studied shop practice and mechanical engineering subjects with the International Correspondence Schools. He entered the employ of the Canadian National on November 1, 1923, as a telegraph messenger. On March 23, 1924, he became a machinist apprentice; on March 27, 1929, a locomotive draftsman; on June 15, 1935, material inspector; on January 1, 1938, mechanical inspector, Atlantic Region, and on August 16, 1943, mechanical inspector for the entire system. For several months during the period from January 1, 1938, to August 16, 1943, he was acting assistant locomotive foreman and locomotive foreman at Sydney, N. S., and Moncton.

B. L. Thompson

O. J. Protz, superintendent of locomotive and car shops of the Chicago & North Western, has been appointed superintendent of motive power, Northern district, with headquarters as before at Chicago. Mr. Protz was born at Winona, Minn., on February 23, 1886, and entered railway service on April 9, 1903, as a fitter helper in the pipe department of the North Western at Winona. He served as a machinist apprentice and machinist, with the same headquarters, and in February, 1914, became engine foreman at Wyeville, Wis. In 1917 Mr. Protz was transferred to Huron, S. D., and three years later he was promoted to the position of general foreman, with headquarters at Belle Plaine, Iowa. From 1920 to 1927 he served as general foreman at Missouri Valley, Iowa, and Chicago. In April, 1928, he became master mechanic with headquarters at Winona, being transferred to Escanada, Mich., in 1929, and to Clinton, Iowa, in 1931. On October 1, 1939, Mr. Protz was appointed superintendent of locomotive and car shops at Chicago.

Otto J. Protz

Master Mechanics and Road Foremen

Willard E. Brautigam, who has been appointed division master mechanic of the Chicago, Milwaukee, St. Paul & Pacific, with headquarters at Deer Lodge, Mont., as noted in the October issue, was born on September 21, 1892, in Laramie, Wyo. He attended Tacoma High School and from 1913 to 1915 was both a student at the University of Washington and an electrician in the employ of the Milwaukee at Tacoma, Wash., and Seattle. He was electric locomotive electrician at Deer Lodge and Avery, Idaho, from 1915 to 1920; electrical instructor at Tacoma, 1920 to 1923; night enginehouse foreman at Deer Lodge, 1923 to 1925; enginehouse foreman at Deer Lodge from 1925 to 1926; electrical inspector from Tacoma to Harlotown, Mont., 1926 to 1928, and enginehouse foreman at Deer Lodge 1928 to 1943.

W. E. Brautigam

Purchasing and Stores

Howard Crouse, general storekeeper of the Texas & Pacific at Marshall, Tex., has been appointed purchasing agent, with headquarters at Dallas, Tex.

Obituary

Arthur B. Childs, chief mechanical engineer of the Northern Pacific, with headquarters at St. Paul, Minn., died in Minneapolis, Minn., on November 4.

F. S. McClung, purchasing agent of the Texas & Pacific, with headquarters at Dallas, Tex., died on October 20, after an illness of three months.

Trade Publications

Copies of trade publications described in the column can be obtained by writing to the manufacturers, preferably on company letterhead, giving title. State the name and number of the bulletin or catalog desired, when it is mentioned.

Tools for Electrical Maintenance.—Ideal Commutator Dresser Company, Sycamore, Ill. Eighty-eight page, 8½-in. by 11 in. catalog designated as Handbook No. 143 and bearing the title, "Speed-Up Tools and Equipment for Maintenance, Production and Construction." Includes illustrated descriptions of commutator reconditioning tools, coil winders, wiring tools, air cleaners, solder and solderless connection, storage battery type flashlights, tachometers, magnetic chucks and variable-speed drives.

◆

Kennametal Carbide Tools, Blanks and Specialties.—Kennametal, Inc., 1000 Lloyd avenue, Latrobe, Pa. Catalog 43C, in three sections, illustrated—Section I, Standard tools; Section II, typical tools; Section III, general information on the origin and characteristics of Kennametal, how to select the proper grade, how to specify and order tools and blanks, etc.

◆

"Lengthened Shadows." — Elwell-Parker Electric Company, Cleveland, Ohio. Fiftieth anniversary book. Reviews company's development since 1893 and, to a considerable extent, that of the industrial truck industry after 1906, the year that Elwell-Parker furnished motors for the first crude baggage-handler for the Pennsylvania. Story reaches back also to the birth in 1843 of Thomas Parker, one of the founders of the electrical industry in Great Britain. The old firm of Elwell-Parker Ltd., manufacturers of motors and dynamos in Wolverhampton, England, in 1893 licensed a separate company to build them in America, but soon after the turn of the century sold its interest in the Elwell-Parker Electric Company, Cleveland.

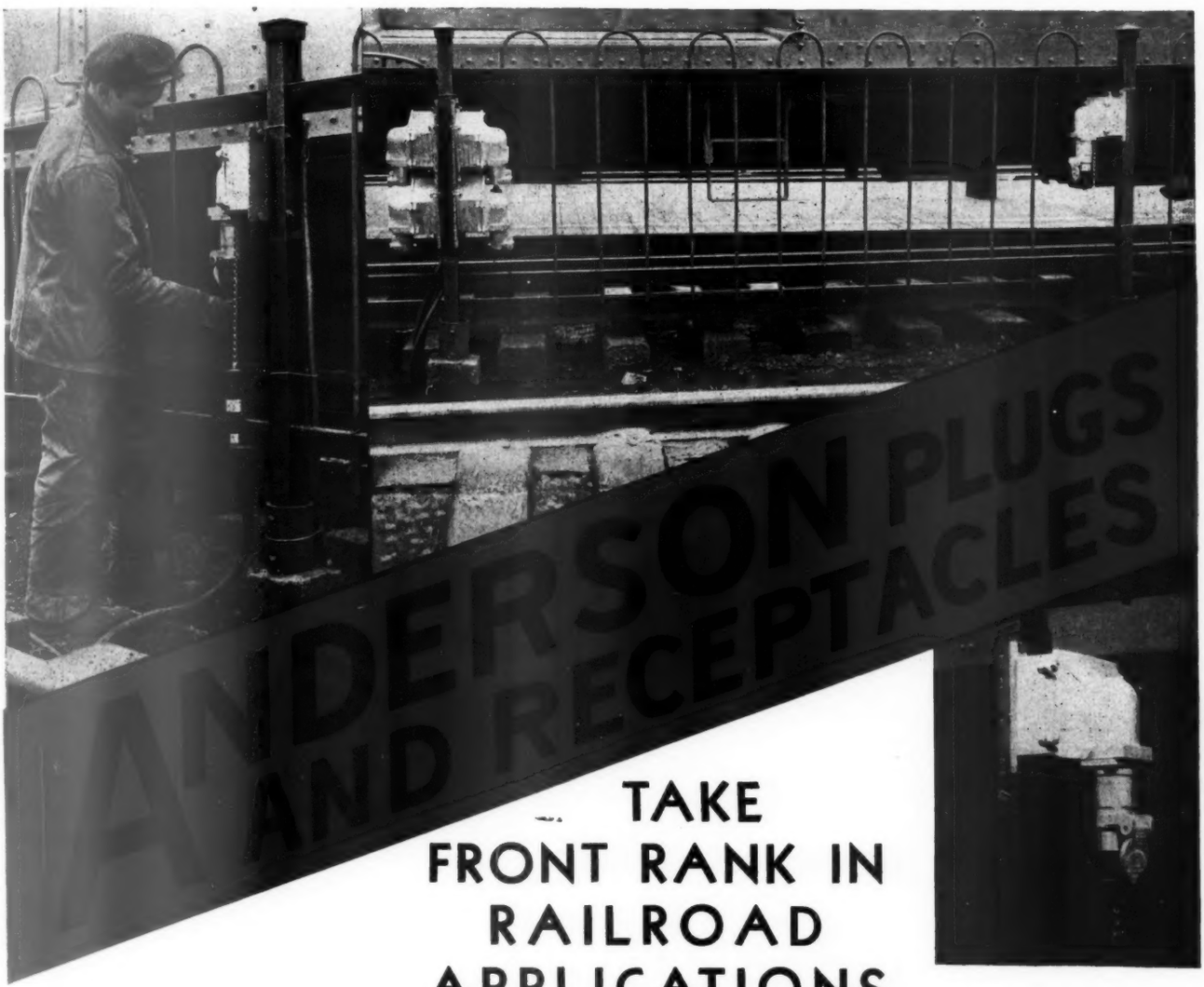
◆

National Machinery Company.—The cold heading and bolt and nut machinery business of the *E. J. Manville Machine Company, Inc.*, Waterbury, Conn., including the corporate name and goodwill, has been acquired by the National Machinery Company, Tiffin, Ohio. After January 1 this new acquisition will be identified as the E. J. Manville Machine Company, Division of the National Machinery Company, Tiffin.

◆

Pressure-Treated Wood. — Koppers Company, Wood Preserving Division, Pittsburgh, Pa. "Economical and Permanent Construction with Pressure-Treated Wood." One of the main sections discusses the uses of pressure-treated lumber in the operation of railroads. A special section explains several processes by which lumber is treated to protect it against decay, marine borers, acids, fire and terminals. Sixteen railroad installations illustrated and recommended uses of pressure-treated lumber in the railroad field listed.

WE SAY IT AGAIN



TAKE FRONT RANK IN RAILROAD APPLICATIONS

WE emphasize the universal employment of Anderson Plugs and Receptacles because of its significance. Since the days when electricity was first put to use in railroad shops, for lighting and for subsequent applications, our products have kept step with the industry.

Anderson equipment is manufactured to the most rigid specifications for use in connection with Air Conditioning, Battery Charging, Marker Lights, Yard Receptacles, Platform Receptacles, Portable Tools, Telephones, Switchboards, Welding Couplers, Watertight Plugs and Receptacles, Turntables, Industrial Trucks.

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NEW YORK CHICAGO PHILADELPHIA LONDON

the biggest quiz program of a

It doesn't have a $64 question. It has millions of them. It is an international program that must originate in the minds of men — American production men. It should be in the planning stage right now. It has to be ready to go with Victory . . . when plants now three-shifting for war, turn to "peace-work". When world markets are but sixty hours from your shipping depot. When your peace-work product must meet and beat competition. Too late then to plan for better, cheaper, faster production. The time to face the future is *now*. The profitable time to retool is *now*. If it's lathes — turn to LeBlond for better turning equipment.

THE R.K. **Le BLOND** MACHINE TOOL CO., CINCINNATI, 8

NEW YORK 13, 103 Lafayette St. CAnal 6-5281

CHICAGO 6, 20 N. Wacker Dr. STA 5561

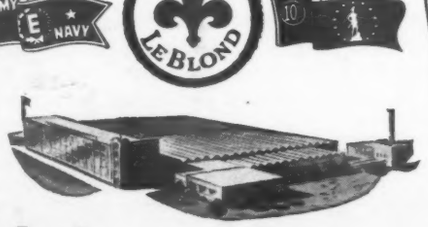
time to retool

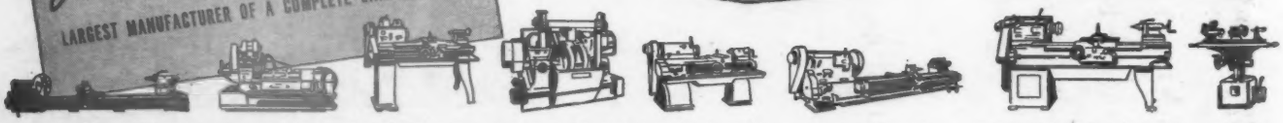
Turn to Le Blond for Turning Equipment

LARGEST MANUFACTURER OF A COMPLETE LINE OF LATHES

ARMY E NAVY

LE BLOND





HD Engine Lathes—Nine sizes ranging from 12" to 50" swings. For versatility in turning.

Automatic Lathes—12" & 16" Mechanical or Hydraulic power.

Super Regal Lathes—Six sizes, 13" to 24" Best for training.

Automatic Crankshaft Lathes—For all facing, turning, finishing, pins.

Tool Room Lathes—12", 14", 16" and 18" swings. Versatile.

HD Gap Lathes—Ten sizes in Regular and Sliding Gap models.

Rapid Production Lathes—13", 17", 20" swings. Six speeds. Faster output. Lower cost.

No. 2 Cutter Grinder—Internal, cylindrical, face and angular work.

Check-Clip-Mail

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- ☐ TOOL ROOM LATHES
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- ☐ SUPER REGAL GEARED HEAD LATHES
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- ☐ No. 2 CUTTER GRINDER

YOUR NAME _____ TITLE _____

YOUR FIRM _____ ADDRESS _____

★ YOUR BONDS BUY BOMBS ★

BUY A "BLOCK-BUSTER" TODAY!

You Can Expedite
MAINTENANCE
on ***POWER*** and
ROLLING stock
by using

FAST-WORKING OAKITE MATERIALS

TODAY . . . when washing, cleaning, decarbonizing and descaling operations on railway equipment must be handled in greater volume at accelerated pace . . . Oakite materials are SPEEDING-UP MAINTENANCE for Mechanical Supervisors who must put power and rolling stock back into service QUICKLY with available manpower.

The trained men of our Railway Service Division are ready and anxious to do the same for YOU, particularly in connection with the work and operations listed in panel at right. Merely write, naming the jobs on which you want help . . . then leave the rest to us. Inquiries promptly answered.

OAKITE PRODUCTS, INC., WRIGLEY BUILDING, CHICAGO 11, ILL.

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Cleaning Locomotive Frames
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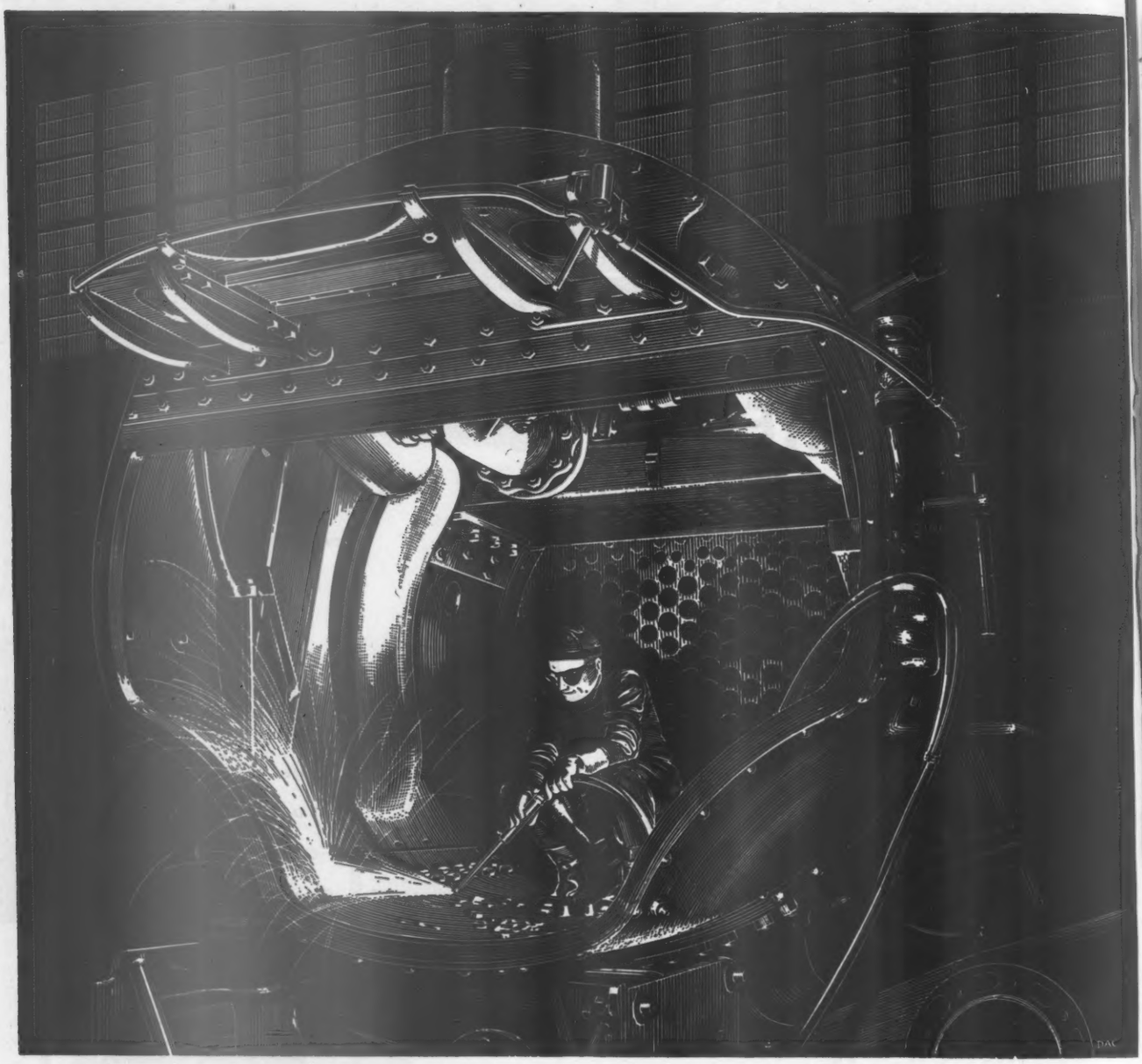
RAILWAY SERVICE DIVISION



Rebirth of a Locomotive

IRON HORSES haul the major load of war production. They must keep rolling. Time out must be held to a minimum.

Above you see a "welder" engaged in washing out rivets to remove worn or damaged parts . . . an essential step to the rebirth of a locomotive. Railroads employ this modern tool for numerous other jobs . . . to shape-cut new metal parts quickly and accurately; to flame harden metal surfaces for resistance to wear; to build up worn rails; to flame clean bridges and other steel structures . . .

As with the railroads, so wherever man works with metal, the oxyacetylene flame and its companion, the electric arc, make possible faster and better ways of fabrication and upkeep.

Through constant improvement in the use of these modern "tools", Airco research is broadening their service to industry. Whether it be for maintenance or production, Air Reduction engineers will assist you in the application of the oxyacetylene flame and electric arc.

★ BUY UNITED STATES WAR BONDS ★

AIRCO WILSON

AIR REDUCTION

General Offices: 60 EAST 42nd STREET, NEW YORK 17, N. Y.

In Texas: MAGNOLIA AIRCO GAS PRODUCTS CO. • General Offices: HOUSTON, TEXAS

SOLDIER SAVED BY ALERT CREW

Private Zacharias Bermudez opened his eyes. He was suffering terribly from his head to his heels.

Then he dimly realized that he was lying on hard ground. The gravel dug into his crumpled body; he couldn't move—just lay there and hurt.

By and by there came a roaring sound—and something rushed past him, screeching and smoking. Then he remembered. He had fallen off a troop train.

The pain in his head drove him nearly crazy. Where had he been going? Oh yes—eastward through Kansas. Funny how hard a cold wind could blow in Kansas. Still, he reflected, it was late in November.

More trains rushed past him. Two tumbleweeds, blown against him, nestled down by his head. So this was to be the finish of one soldier who wanted to fight the Germans!

Well, folks said freezing wasn't so painful. You just eased off into sleep, and that was the end of it. But it was rotten bad luck for a fellow who was willing to meet death in battle.

Private Zacharias Bermudez felt sleep stealing over him as another train hurtled past. That train—although Bermudez didn't know it—was the Missouri Pacific's No. 77, west bound on the Central Kansas division.

Engineer T. C. Tiller and Fireman H. C. Snodgrass were on Locomotive 2114, pulling that train. Both saw the object lying near the roadbed on the right-of-way.

"Might be just a tumbleweed," Snodgrass yelled to Tiller.

"I thought it looked like a soldier's uniform," Tiller yelled in reply.

Ten miles ahead was Leoti, where No. 77 wasn't scheduled to stop.

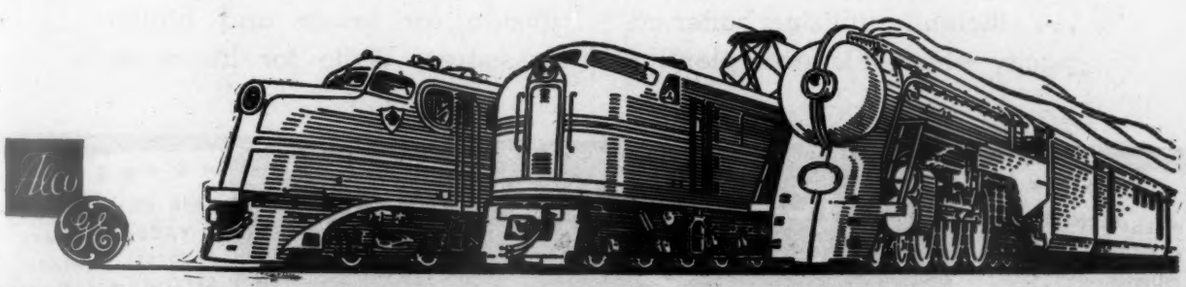
Taking no chances on losing a life, Snodgrass hurriedly scribbled a note, telling what the crewmen had seen, and tossed it off at Leoti station to Agent R. E. Padgett.

A troop train had passed through Leoti six hours before. Padgett dispatched a section crew to the scene.

Later, at the Scott City Hospital, examination revealed that Bermudez was suffering from a fractured skull and other injuries. On January 16, the Hospital released him, and he was sent to Camp Roberts, California—and to the military service he longed for.

But this soldier might have died, if Engineer Tiller and Fireman Snodgrass had not done some heads-up thinking and taken quick action.

—The Trackwalker



AMERICAN LOCOMOTIVE • GENERAL ELECTRIC

Copr., 1943, American Locomotive Company and General Electric Company

112-47-9690

Another CP Steam-Driven Compressor GUARDS AGAINST POWER FAILURE

This CP Horizontal Duplex, Steam-Driven Compressor, installed in a war plant is safeguarding production against shutdown through power failure of the synchronous motor-driven CP Compressor installed with it.

CP Steam-Driven Compressors are playing their part in the war effort . . . protecting vital war plants against interruption of air supply due to power line failure . . . efficiently utilizing boiler capacity where it is more plentiful than electrical current . . . providing exhaust steam where needed for heating or process work.

CP Steam-Driven Horizontal Duplex, Two-Stage Compressors are ideal for large and medium-size plants. Capacities range from 400 to 6600 c.f.m., 100 to 125 pounds air pressure with steam cylinders available for a wide range of steam conditions. Other sizes in single and multi-stage design for lower and higher pressures. Write for literature.

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(Hicycle...Universal)
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AIR COMPRESSORS
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stand-by, *n.* **One that can be relied upon.**

Lock Nuts, the first product of the MacLean-Fogg Lock Nut Co., are still the "old stand-by" of this organization ... dependable wherever used. "M-F" Lock Nuts have been known and used throughout the railway field for over 15 years. Today, more than ever, they are helping to keep rolling stock moving by maintaining sound fastenings.

MAC LEAN-FOGG LOCK NUT COMPANY

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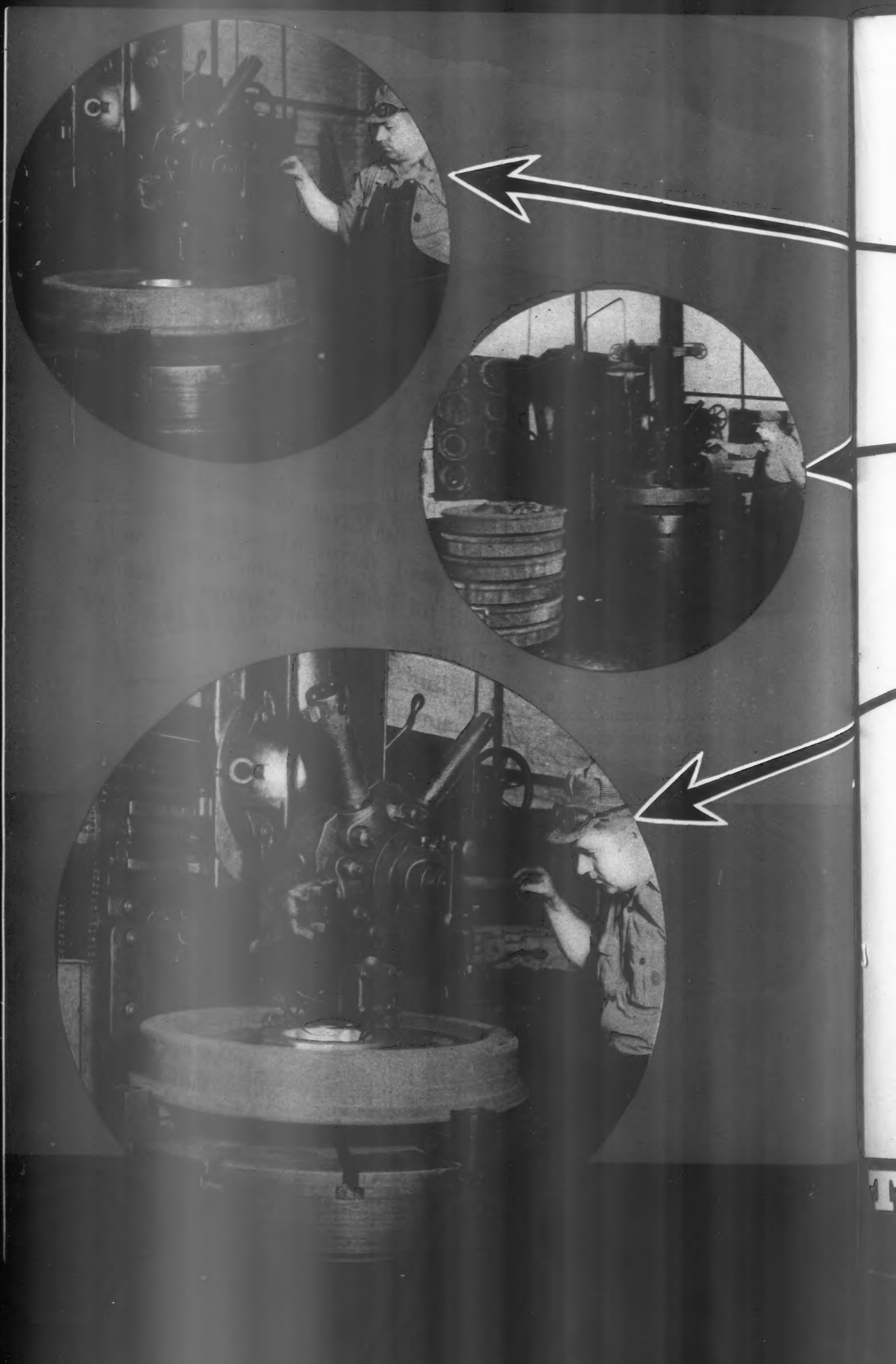
In Canada: The Holden Co., Ltd., Montreal



Streamlining the STREAMLINERS

HIGH speed trains demand high speed wheels—concentricity and accurate balance are very important factors in the elimination of wheel stresses.

Bullard Vertical Turret Lathes are helping the railroads to solve this problem. Illustrations on the opposite page show a standard 42" V.T.L. which is used exclusively for the boring and machining of wheels for Diesel Locomotives and streamlined trains.

Machining operations include boring for axle fit—facing and turning of the hubs and the plate. Tolerance limits are .001 plus and .003 minus.

The Vertical Turret Lathe has been a standard railroad shop tool for many years. Bullard engines are constantly working on new methods to reduce locomotive repair costs—they are always ready and willing to help you with your problems.

BULLARD R.R. SHOP UNITS

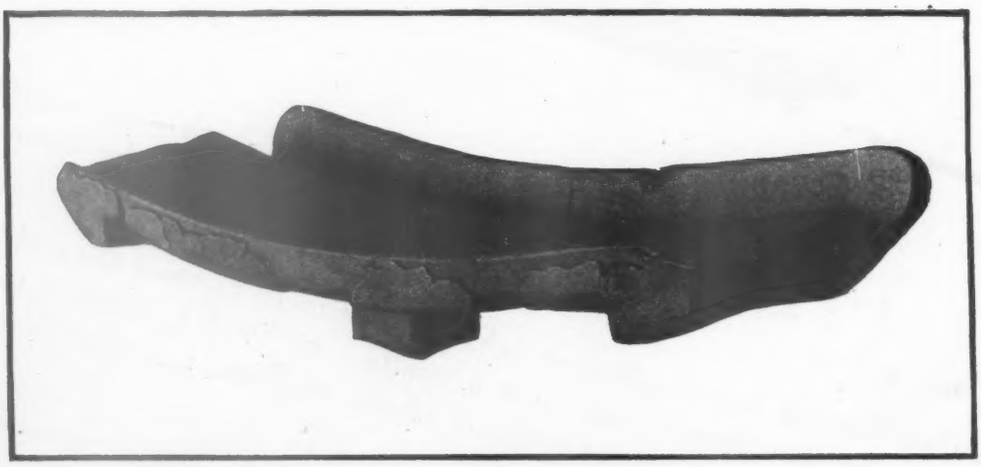
THE BULLARD COMPANY

BRIDGEPORT 2, CONNECTICUT

Avoid Waste!

RECOGNIZE THE LIMITS OF WEAR FOR YOUR DRIVER BRAKE SHOES

Get full service from your driver brake shoes by wearing them evenly to a thickness of ½". Removing them from service *before* this limit has been reached will waste useful metal. Wearing them *beyond* this limit may injure wheels and brake heads. Play safe and follow the prescribed limits of wear.



● Evenly worn driver brake shoes are the result of good brake shoe practice. This shoe is evenly worn and has rendered maximum service.

BRAKE SHOE AND CASTINGS DIVISION • 230 PARK AVENUE • NEW YORK, N. Y.

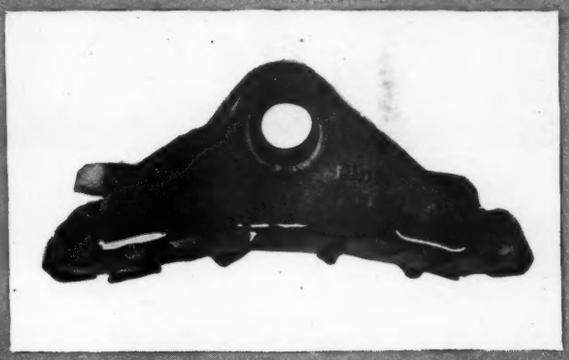
AMERICAN **Brake Shoe** COMPANY

Enlarged and mounted reproductions of this advertisement and our previous advertisement featuring good car brake shoe practice are available upon request for posting in shops.

3419

THESE ARE THE PENALTIES OF POOR DRIVER BRAKE SHOE PRACTICE

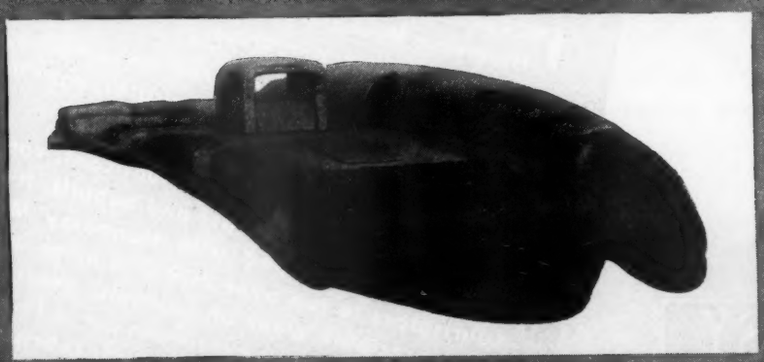
This shoe has been worn beyond the safe limit of wear and has caused injury to the brake head.



This brake shoe has been worn into the steel back. The steel back is badly distorted and has become welded to the brake head. It was necessary to scrap the brake head along with this shoe.

This shoe has been severely battered on top of the lug by the brake lever (probably due to a worn pin hole in the brake head). The lug has been so distorted that the key could be removed from the brake head only by cutting with a torch.

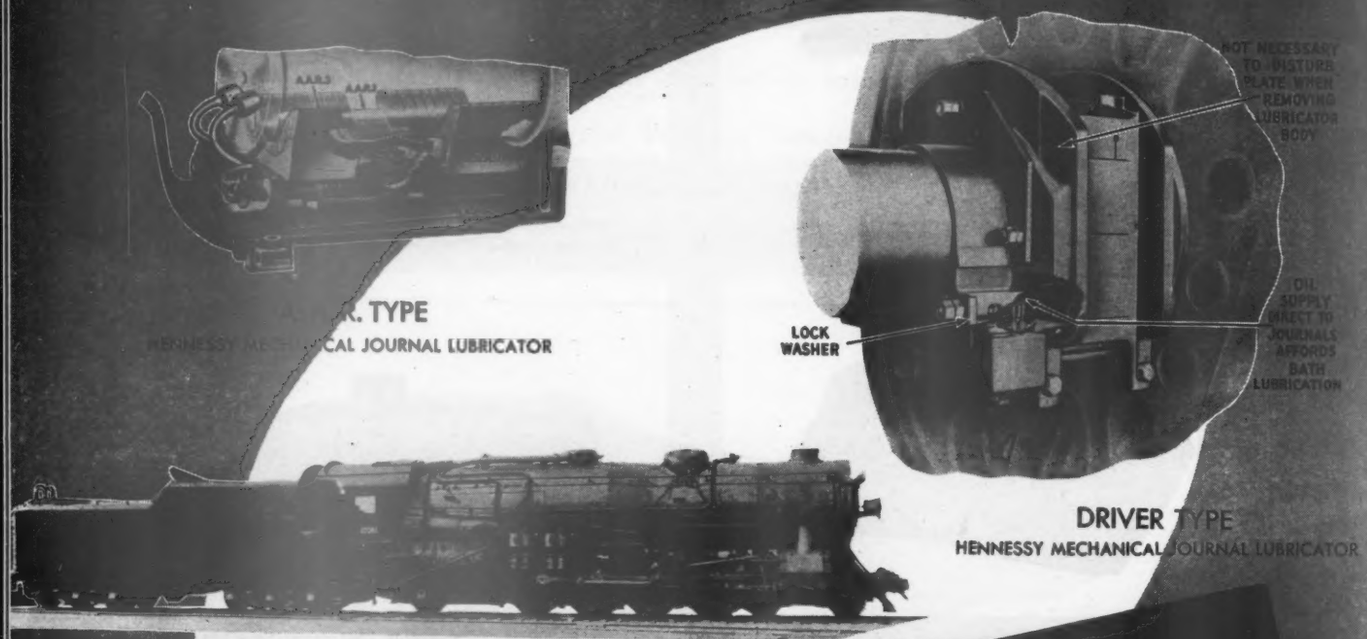
Due to faulty brake rigging, this driver shoe has become taper-worn. As a result, it had to be removed from service even though useful metal still remained on one end.



A wedge-worn driver shoe, probably caused by a hollow-worn tread or a cocked brake head on the driver wheel. Although this shoe has been worn to the condemning limit on its outside edge, there is nearly original thickness on the flange side. Brake head pins should be kept tight.

WITH THE HENNESSY
Mechanical Journal Lubricator

You Can Run Your Locomotives
TO THE LIMIT!


NOT NECESSARY TO DISTURB PLATE WHEN REMOVING LUBRICATOR BODY
OIL SUPPLY DIRECT TO JOURNALS AFFORDS BATH LUBRICATION
LOCK WASHER

R. TYPE
CAL JOURNAL LUBRICATOR

DRIVER TYPE
HENNESSY MECHANICAL JOURNAL LUBRICATOR

4-8-2 FREIGHT LOCOMOTIVE
264,000 LBS. WEIGHT ON DRIVERS

INCREASED availability of locomotives is a certainty when Hennessy Mechanical Journal Lubricators provide oil bath lubrication to every bearing.

Much shorter time is required for servicing, because of the ease of applying oil to the lubricator, resulting in decreased cost of maintenance.

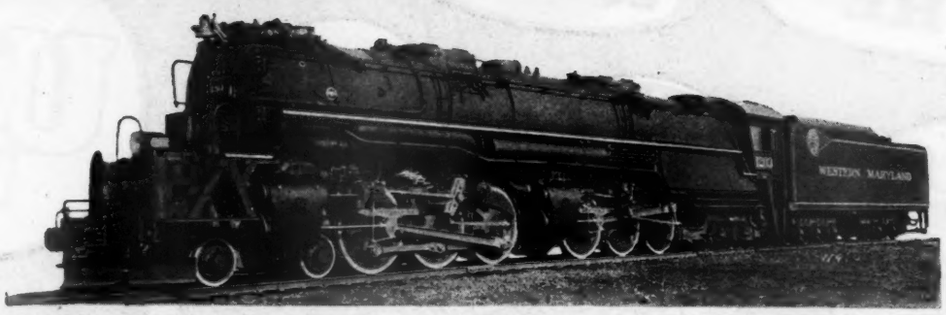
The use of oil, the proper lubricant, conserves vital materials such as steel, brass and babbitt. It is not unusual for locomotives equipped with Hennessy Mechanical Journal Lubricators to run over 200,000 miles without any repairs or appreciable wear on journals, bearings and hub faces. No crown brass has ever worn out in service when provided with Hennessy Positive Oil Bath Lubrication.

HENNESSY LUBRICATOR

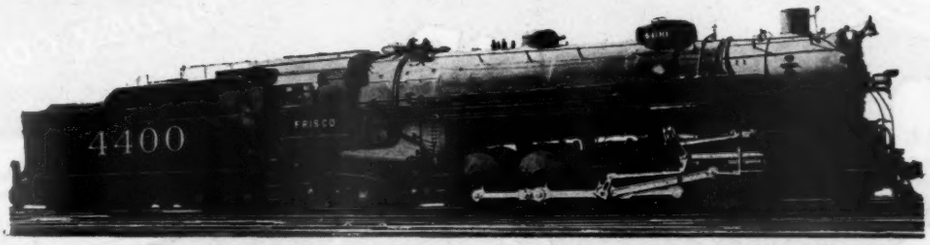
HENNESSY LUBRICATOR CO., Inc.
NEW YORK 6, N. Y.

MODERN LOCOMOTIVES EQUIPPED

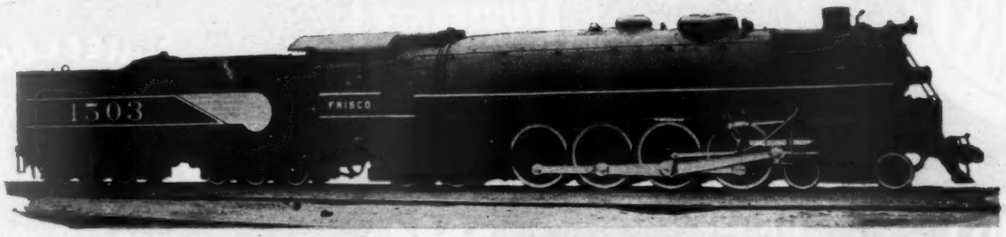
WITH HENNESSY MECHANICAL JOURNAL LUBRICATORS



4-6-6-4 FAST FREIGHT. DRIVING, TRAILER AND TENDER JOURNALS. 402,266 LBS. WEIGHT ON DRIVERS.

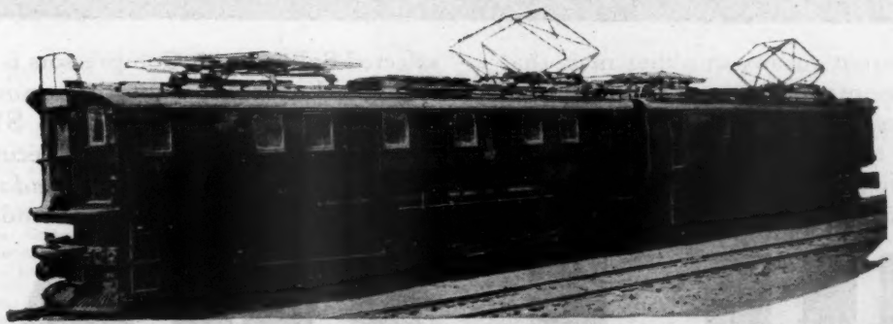


4-8-2 FAST FREIGHT. LEAD TRUCK, DRIVING AND TRAILER JOURNALS. 278,950 LBS. WEIGHT ON DRIVERS.



4-8-4 DUAL FAST PASSENGER-FREIGHT. ALL JOURNALS: LEAD TRUCK, DRIVING, TRAILER, TENDER. 280,000 LBS. WEIGHT ON DRIVERS

4-8-2 FAST FREIGHT. ALL JOURNALS: LEAD TRUCK, DRIVING, TRAILER, TENDER. 255,000 LBS. WEIGHT ON DRIVERS.



2-8-2+2-8-2 ELECTRIC HEAVY FREIGHT. ALL DRIVING JOURNALS. 396,000 LBS. WEIGHT ON DRIVERS.

HENNESSY LUBRICATOR CO., Inc.

NEW YORK 6, N. Y.

It must be apparent to any thinking man that the larger and more prominent the organization, the less it leaves the selection of vital production equipment to mere guesswork and opinion. The fact that the most prominent industrials in America, including those named above, have selected Sullivan Air Compressors is a judgment which *no* buyer who wants the utmost in dependability can afford to overlook. SULLIVAN MACHINERY COMPANY, Executive Offices: Michigan City, Indiana. *In Canada:* Canadian Sullivan Machinery Co., Ltd., Dundas, Ontario.

SULLIVAN

Air COMPRESSORS

PULLMAN-STANDARD CAR MANUFACTURING CO
Built by Pullman

SOLAR AIRCRAFT COMPANY

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SERVEL GAS REFRIGERATOR

BENDIX AVIATION LTD

M-R-C Strom SRB GURNEY BALL BEARINGS

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BELL Aircraft
Airacobras for victory

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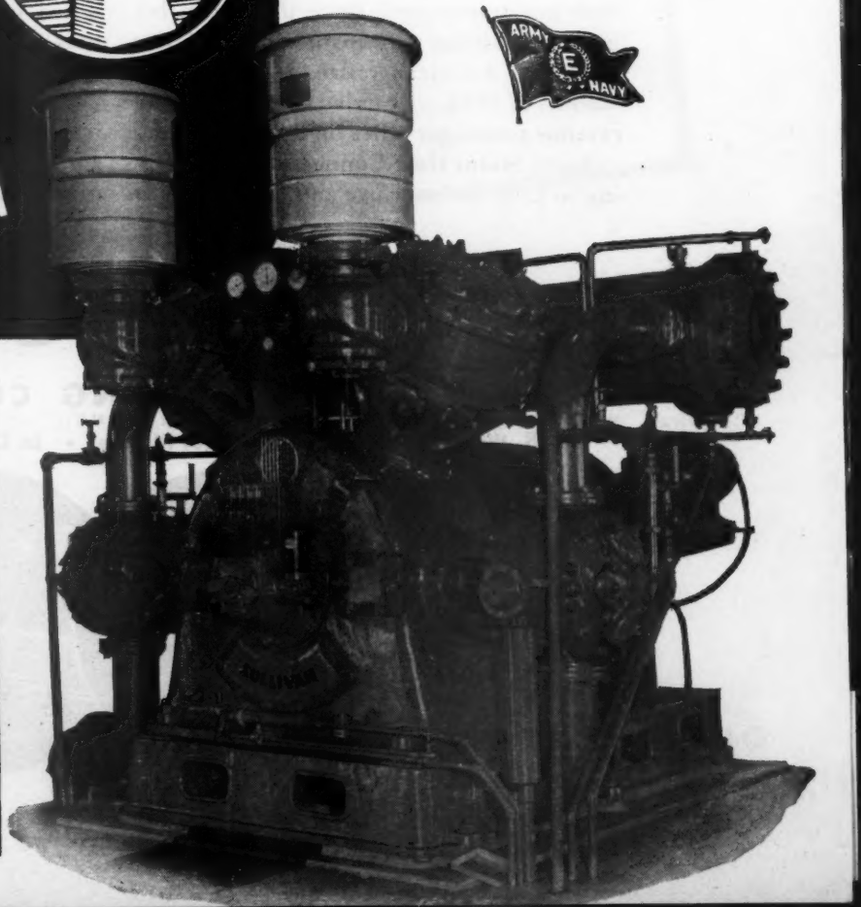
SAVAGE ARMS CORPORATION

PORTLAND PENN-DIXIE CEMENT

WEIL-McLAIN

They Bought SULLIVAN Air Compressors

ARMY E NAVY



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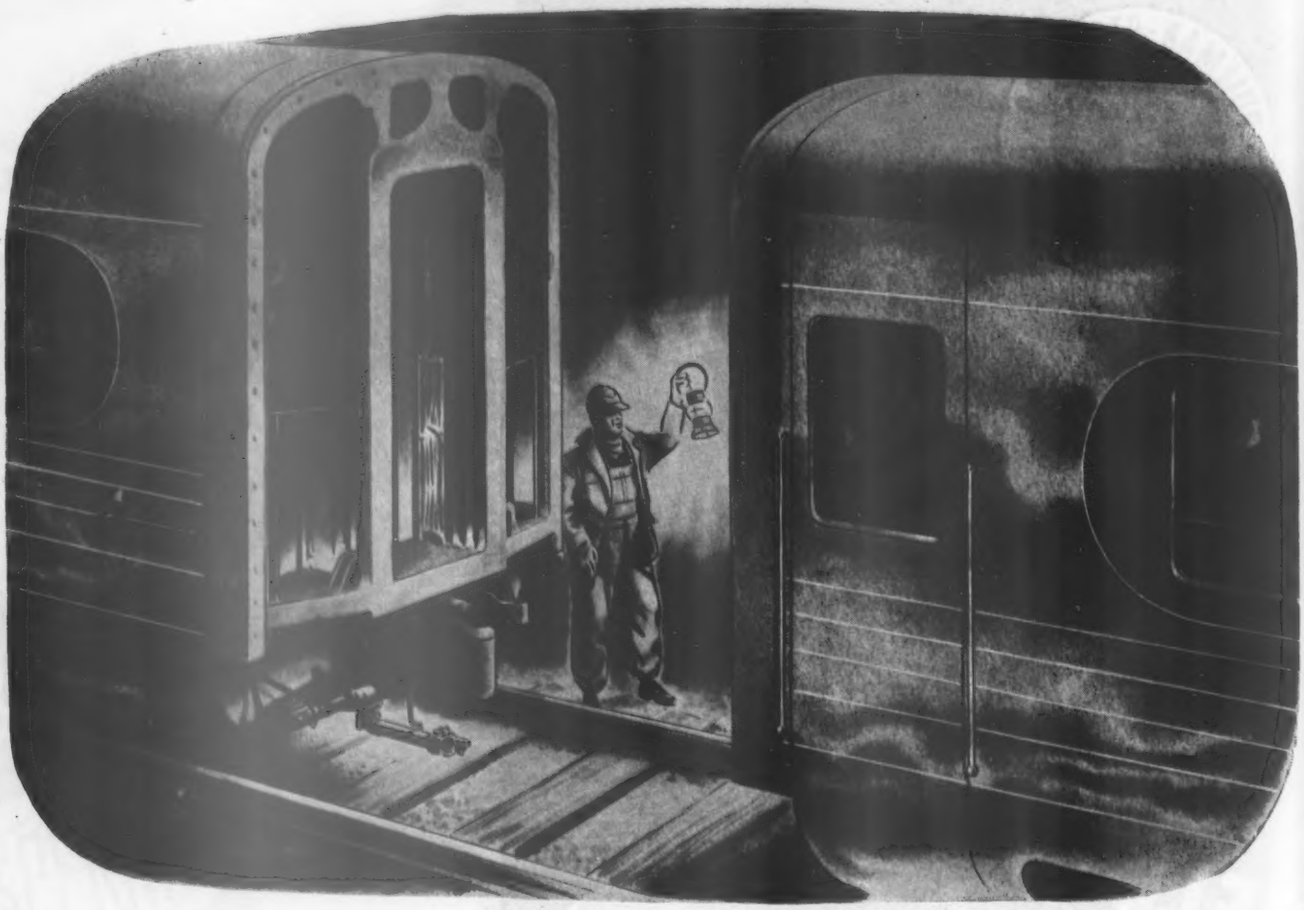
PRODUCTS

HEAVY DUTY, SINGLE OR TWO STAGE STATIONARY AIR COMPRESSORS IN ANGLE, V-VERTICAL, VERTICAL OR HORIZONTAL TYPES IN SIZES FROM 1/4 TO 3000 H. P. ALSO A COMPLETE LINE OF PORTABLE COMPRESSORS



STEAM HEAT ON WHEELS

Today American railroads are carrying *more* traffic of every kind than *any* country at *any* time has transported since the world began. In addition to transporting vital war materials, American railroads . . . in seven months of 1943 . . . carried 47,500,000,000 revenue passenger miles on the home front!

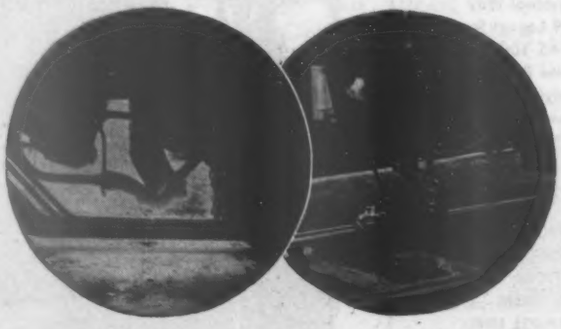
Barco Steam Heat Connections are helping to keep maintenance and labor costs at a minimum. They provide the least possible obstruction to the flow of steam and are noted for their extreme simplicity, small number of wearing parts and freedom from leakage.

We're proud of the great record that American railroads are building in this war . . . and we're also proud of our years of service to the railroad industry.

BARCO

MANUFACTURING COMPANY
NOT INC.

1808 Winnemac Avenue, Chicago, Illinois • In Canada—The Holden Co., Ltd.



Air, steam and oil connections between locomotive and tender.

Passenger car steam heat connections.

The Chronological Story Of Timken Bearings On The Northern Pacific . .

1. The Timken Locomotive, No. 1111, was loaned to the Northern Pacific to demonstrate the advantages of Timken Bearings on Oct. 28, 1931.

2. After exhaustive tests the Northern Pacific purchased the Timken Locomotive on January 1, 1933.

3. Subsequent orders for completely Timken Bearing Equipped engines through the years are as follows:

YEAR	NUMBER OF LOCOMOTIVES	TYPE	
1934	10	4-8-4	
1936	14	4-6-6-4	Six of these for SP&S.
1937	11	4-8-4	Three of these for SP&S.
1937	9	4-6-6-4	These converted to Timken Bearings in Northern Pacific Shops.)
1940	12	2-8-8-4	
1940	8	4-8-4	
1940	6	4-6-6-4	
1942	10	4-8-4	
1942	12	4-6-6-4	
1943	10	4-6-6-4	Two of these for SP&S.
	total 102		

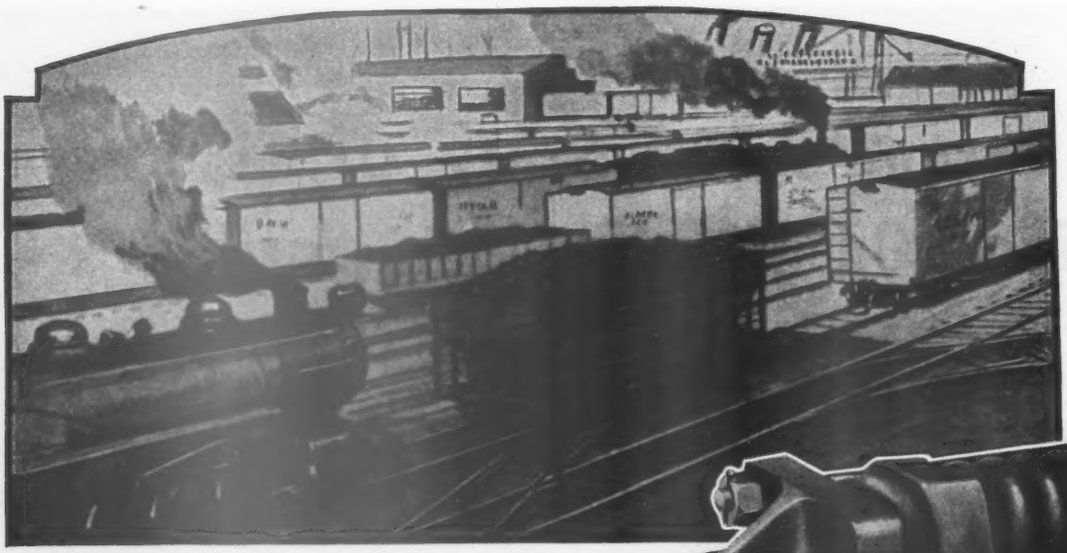
Could there be a stronger testimonial on the performance and value of Timken Bearings.

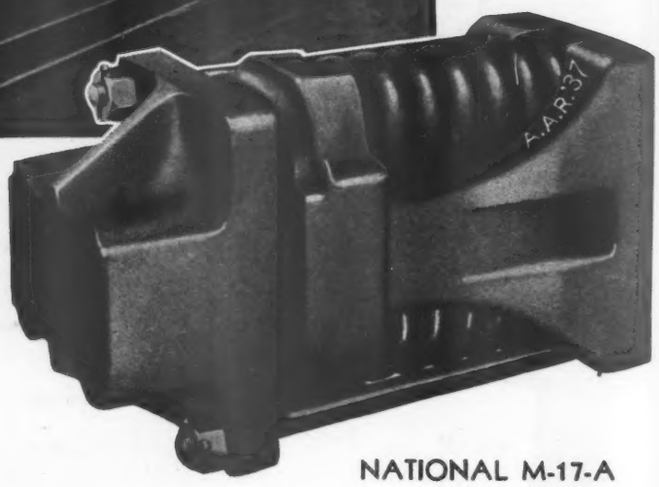
TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

RAILWAY ROLLER BEARINGS

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO





NATIONAL M-17-A

Car Protection Is Important

Adequate Draft Gear protection will reduce time out for repairs and increase car mileage.

When a loaded freight car shoots down the switch track at excessive speed, standing cars must be protected by draft gears of exceptional shock absorbing ability.

Safe cushioning of the heaviest or the lightest blows is necessary for the protection of car and lading.

It was to meet such extreme conditions that National Draft Gears were designed. Smooth starting action and high ultimate capacity absorb light or heavy blows with the least possible shock.

NATIONAL FRICTION DRAFT GEARS

A. A. R. Approved

NATIONAL M-50-B

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General Offices: CLEVELAND, OHIO

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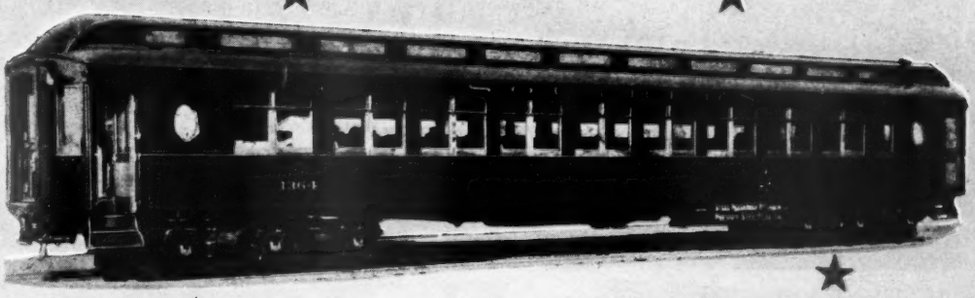
Creators of
PASSENGER EQUIPMENT



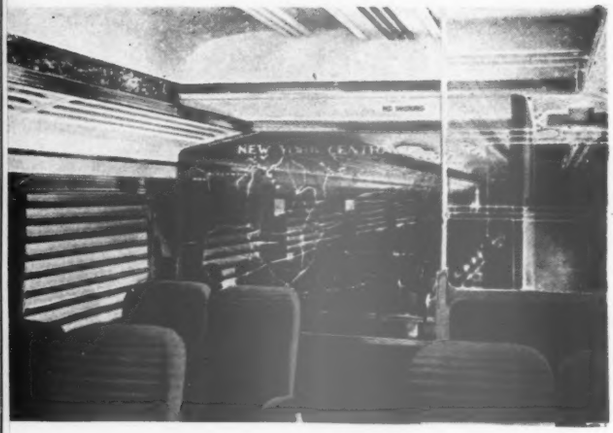
MODERN IN 1906

MODERN IN 1943

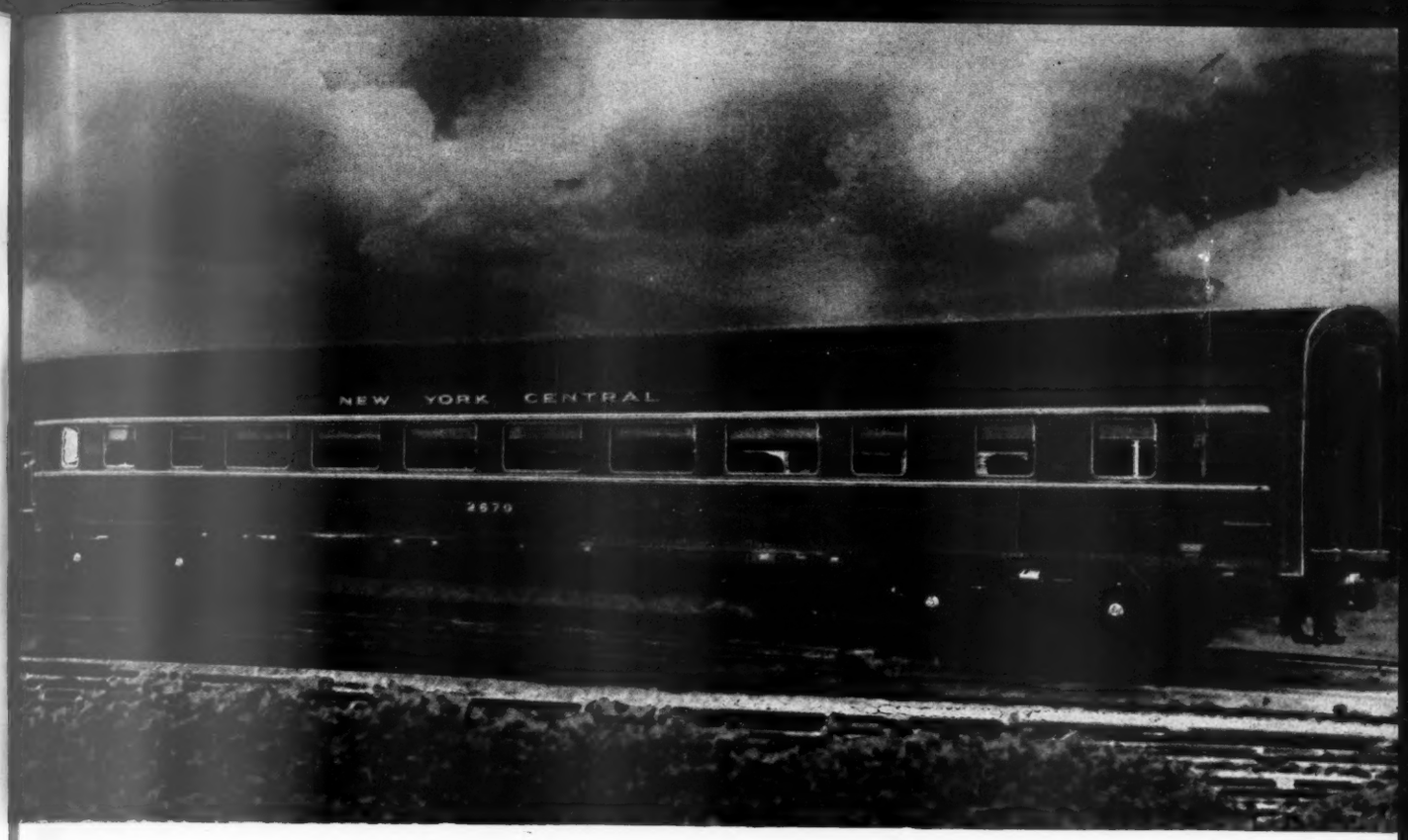
PRESSED STEEL CAR COMPANY, Inc.

PITTSBURGH, PA.

★ ADVANCED ★ ENGINEERING



BEHIND EVERY PASSENGER CAR CREATION



THE PRESSED STEEL CAR COMPANY, the pioneer builders of steel passenger cars, has been building passenger equipment for over forty years. The two deluxe coaches illustrated on these pages are outstanding examples of modern construction in recent years.

PRESSED STEEL
CAR COMPANY, INC.
PITTSBURGH, PA.

WHEN Victory is won, PRESSED STEEL CAR will continue to pioneer in the building of passenger and freight cars.

PRESSED STEEL CAR'S research and engineering staffs, which have demonstrated exceptional ingenuity and versatility in the design and production of war goods, are preparing the peace-time marvels of tomorrow.

What we have learned about new alloys, synthetic chemicals, plastics, new fabrics, improved welding and new assemblies, under the impetus of war, will be forged into newer designs of passenger cars — which will be safer, more economical, durable, more comfortable, and more attractive. As yesterday, so tomorrow PRESSED STEEL CAR'S sole purpose is to help give the railroads the finest in rolling stock.

John Maintenance says:

EXPERIENCE SHOWS AIR PUMPS NEED TWO TYPES OF PACKING

For many years Johns-Manville has recommended the use of one type of packing for the steam end, and another type for the air end of locomotive air pumps. Why? Because the air end is much hotter than the steam end and the air end has no internal lubrication.

Packing Style R-15 for the steam end has a core of asbestos rope with two wrappings of treated asbestos cloth, and is fully lubricated. Packing Style R-55 for the air end has copper wire-inserted asbestos yarn, braided jacket-over-jacket, and is fully lubricated with a high heat-resistant compound.

In applying J-M Combination R-15 and R-55 air pump packing, be sure to get the right packing on the proper rod end. In maintenance, be certain to keep the swabs oil-soaked to lubricate the packing. Do not adjust the gland too tight.

For full details on J-M Packings, write Johns-Manville at New York, Chicago, Cleveland, St. Louis, or San Francisco.

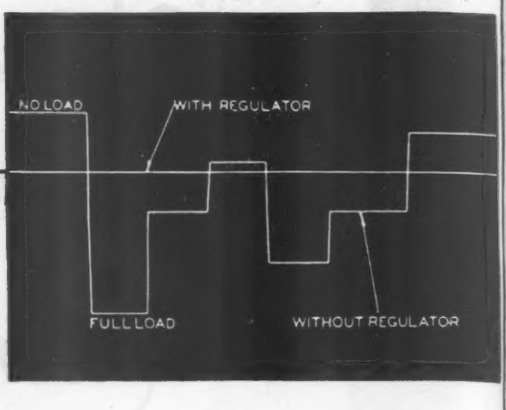
JOHNS-MANVILLE

85 YEARS OF SERVICE TO TRANSPORTATION

JOHNS-MANVILLE JM PRODUCTS

CONTROL

• VOLTAGE
• CURRENT
• SPEED



Realize the Full Value of Your Equipment

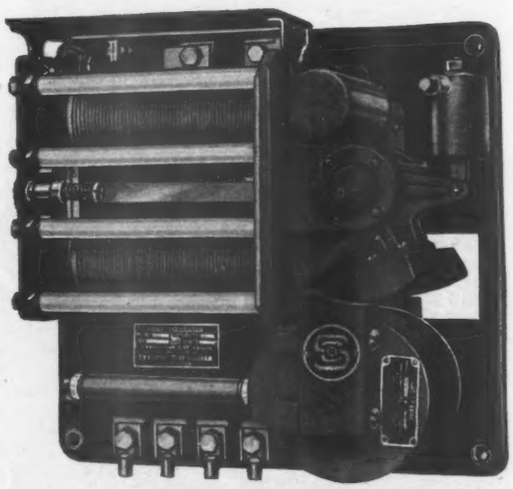
WITH SAFETY CARBON PILE REGULATORS AND REVERSE CURRENT RELAYS

WHEREVER electrical equipment is used, SAFETY Carbon Pile Regulators and Reverse Current Relays provide a positive economical answer to the problem of voltage, current or speed regulation.

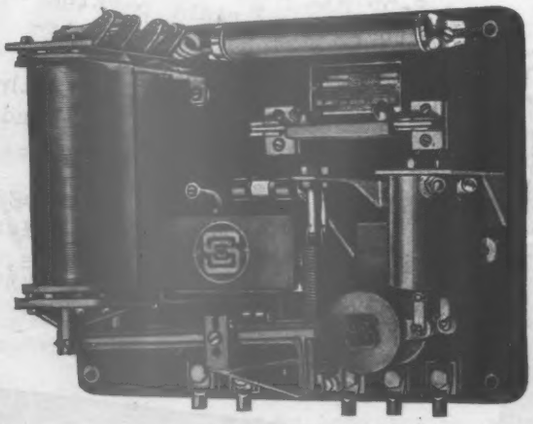
Dependable, low cost self-actuating rheostats of sturdy simple construction, these regulators furnish accurate, automatic control of voltage, current and speed over wide ranges.

These regulators and relays have been time tested by thousands of Equipments in Service in many fields. They are standard equipment on railroad cars and on ships.

SAFETY Regulators effect substantial saving in industries by affording full protection to generating and consuming devices against damage and deterioration because of changes in voltage, current or speed.



TYPE S700E CARBON PILE REGULATOR



TYPE S75EA CARBON PILE REGULATOR

APPLICABLE to all types of alternating and direct current equipment, these regulators maintain voltage or current constant regardless of fluctuations of load or line.

WRITE FOR CIRCULAR WITH LIST OF APPLICATIONS

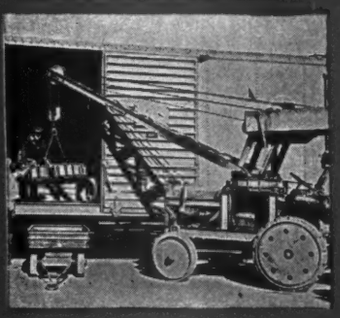
THE SAFETY CAR HEATING and LIGHTING COMPANY, INC.

NEW YORK - CHICAGO - SAN FRANCISCO - PHILADELPHIA - BOSTON - ST. LOUIS - MONTREAL

(Official U. S. Navy Photo) Roustabout Cranes are hustling war materiel at home and overseas.

Roustabout Crane handling U. S. 1000 pounder bombs in Britain. (Official Signal Corps Photo).

Roustabout Crane puts motor in place on Liberator Bomber at Consolidated Vultee's San Diego plant.



Free-Roving Tractor-Footed ROUSTABOUT CRANES help win the Big Scrap more quickly

ROUSTABOUT CRANE'S handling, stacking, loading speed and versatility—now widely serving armed forces, war plants, air fields and transport organizations—promise you new efficiency and lower costs after the war. For these powerful load-hustlers, on wheels or crawler tracks, are *where* you want 'em *when* you want 'em, preventing delays, keeping things moving, bulky stuff to 5 tons. Easy to operate, all tractor power, full swing boom on ball-bearing turntable, gears in oil—built for years of overwork. For fast action now, for post-war cost cutting, write for the Roustabout Crane story.

THE HUGHES-KEENAN CO.
605 Newman Street, Mansfield, Ohio

ROUSTABOUT CRANES
By Hughes-Keenan
Load-Handling Specialists Since 1904

NICKEL AIDS THE POWER INDUSTRY

to KEEP 'EM OPERATING!

In this day of acute shortages of almost everything, power plant engineers are doing an amazing job of meeting demands for power—the power to keep 'em operating.

Part of this success is due to their foresight in specifying materials that assure long life and withstand the added hardships imposed by ever-increasing peak-load demands.

With the production of tanks, guns, and planes dependent upon power capacity, Nickel makes a valuable contribution towards uninterrupted operation, through the improved properties it imparts to ferrous and non-ferrous alloys used in power plant equipment.

So today the exigencies of war illustrate more clearly than ever the simple truth of the familiar axiom, "A little Nickel goes a long way" toward increasing the dependability of power plant equipment, from turbine blades to high pressure valves, from flange bolts to shaft forgings.

The technical staff of International Nickel has been privileged to cooperate with the power plant engineers and Government authorities who have made possible the great increases in power on which so much of the war effort depends. INCO engineers and metallurgists offer counsel and data to all who desire assistance in the selection, fabrication, and heat treatment of ferrous and non-ferrous metals.

New Catalog Index

New Catalog C makes it easy for you to get Nickel literature. It gives you capsule synopses of booklets and bulletins on a wide variety of subjects—from industrial applications to metallurgical data and working instructions. Why not send for your copy of Catalog C today?

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THE INTERNATIONAL NICKEL COMPANY, INC., *67 Wall St., New York 5, N. Y.*

GET MORE SERVICE from existing cars with SBS SNUBBERS

Performance of all-coil spring groups can be greatly improved by replacing one A.A.R. spring with an SBS Snubber. This economical method:

1. Stops Destructive Car Bounce.
2. Prevents Solid Blows.
3. Reduces Coil Spring Breakage.
4. Keeps Cars off Repair Track.
5. Lowers Track Maintenance.

Due to the Rubber Shortage, the type SBR Snubber has been replaced by the SBS—in which transverse coil springs are substituted for the rubber block. Proved in laboratory and road tests, the SBS Snubber has been in actual service for over two years.

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Works: ROCHESTER & DEPEW, NEW YORK

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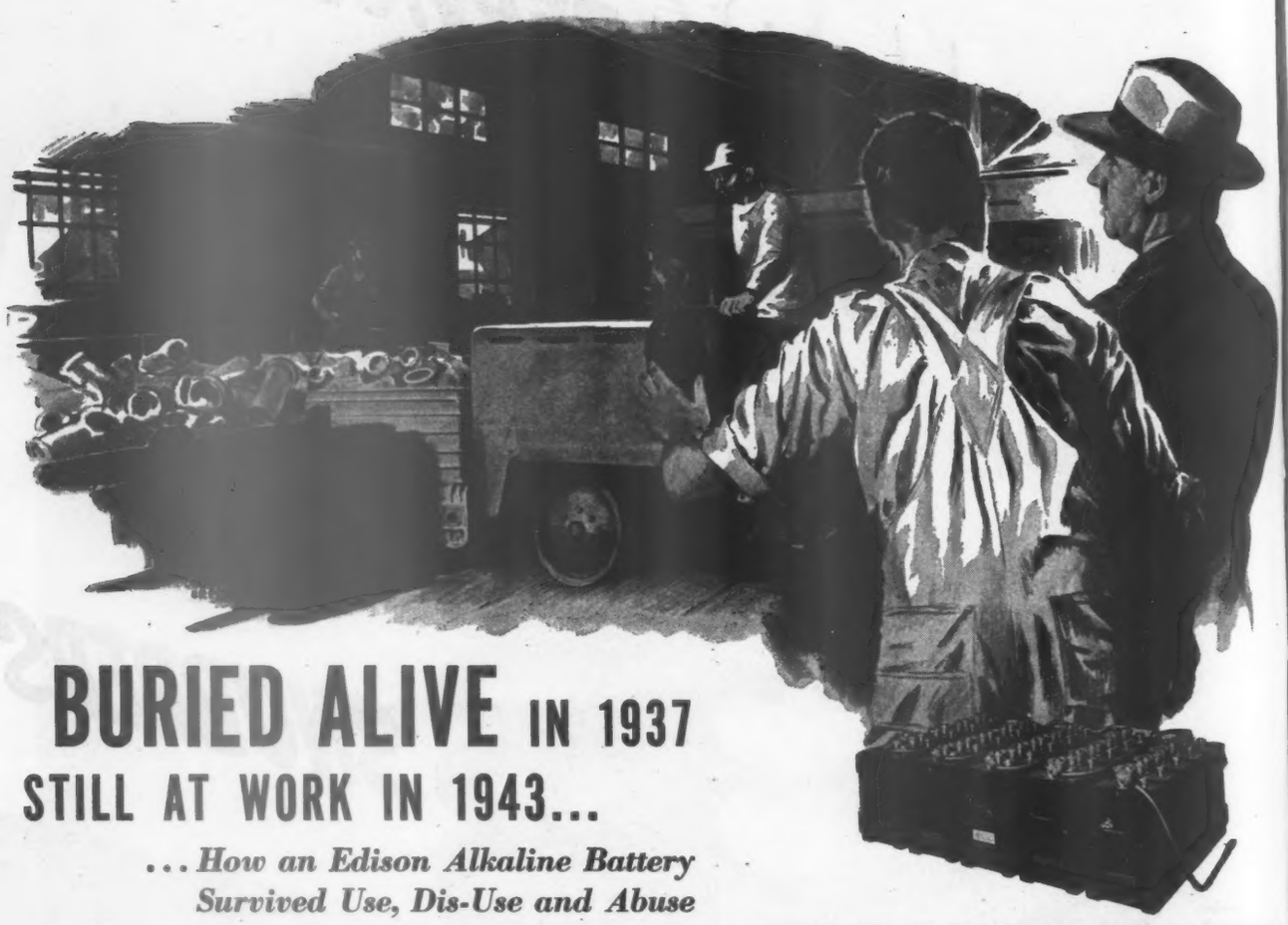


BURIED ALIVE IN 1937

STILL AT WORK IN 1943...

... How an Edison Alkaline Battery Survived Use, Dis-Use and Abuse

In 1937, a midwestern foundry changed hands after being shut down six months. The electrician of the new owners, in the course of putting the industrial trucks into operation, found one of the batteries buried under a mound of earth beside an open trench.

He knew it must have been there at least six months and, although it was an Edison Alkaline Battery, he was naturally doubtful whether it was still serviceable. Nevertheless, he ordered it cleaned, painted and charged. Much to his surprise, it performed satisfactorily in every way when put into one of the trucks. Now, six years later, the electrician tells an Edison engineer that the same battery is still in regular service.

Edison Alkaline Batteries are meant to stand use—long use and hard use, in mines, railroads and industry. They can also stand disuse, indefinitely, if discharged, short-circuited and properly stored. But the fact that they can, and often do, survive outright abuse is striking evidence of their great reserve of dependability under all conditions.

Some of the unique characteristics which enable the Edison Alkaline Battery to stand up under use, disuse and abuse are cited in the column at the right.

ADVANTAGES OF THE EDISON ALKALINE BATTERY FOR RAILWAY-CAR SERVICE

- ★ It is light in weight. Its use reduces total car weight. It is easy to handle.
- ★ It is durable mechanically. High strength steel construction is used in the container, grids, pole pieces, etc. The electrolyte is a preservative of steel. It requires no renewal of separators throughout its long life.
- ★ It is foolproof electrically. It withstands the over-charging and over-discharging inherent in railway-car service. It is not injured by accidental charging in reverse.
- ★ It can be charged rapidly. It may be charged at full normal rate throughout the entire length of charge and is not subject to finish rate limitations. It requires no equalizing.
- ★ It withstands temperature extremes. It is not damaged by freezing. Free air spaces on all sides of all cells provide ventilation for rapid cooling under high temperature conditions.
- ★ It is free from ordinary battery troubles. It is not subject to sulphation, shedding of active material, buckling of plates, jar breakage or other common causes of battery failure.
- ★ It is simple to maintain. Merely charge adequately, add pure water, keep clean and dry.
- ★ Its tray assembly and cell connections are extremely simple.
- ★ Its life is so long that its annual depreciation cost is lower than that of any other type of storage battery.

EDISON STORAGE BATTERY DIVISION, THOMAS A. EDISON, INCORPORATED, WEST ORANGE, NEW JERSEY

Edison

ALKALINE BATTERIES

Every Railroad Man will be interested in this New book

If you have not received a copy of this interesting new A. S. F. book telling a graphic story of our experiences in road testing freight car trucks, be sure to write for a copy. You will find it full of photographs showing laboratory cars and trains, testing apparatus and developments. It is an eye-opening record of the progress we have made in the scientific measurement of freight car riding qualities. Just tear off the signature on this ad and attach your business card or write your name and address in the margin and mail to us.

AMERICAN STEEL FOUNDRIES

CHICAGO

MINT-MARK OF FINE CAST STEEL

STANDARDIZE WITH EX-CELL-O PINS AND BUSHINGS

Ex-Cell-O hardened and ground steel bushings and pins are now used by more than 125 railroads and manufacturers of railroad equipment. Experience has shown that from four to six times longer service is obtained when Ex-Cell-O products are used. . . . The parts to which Ex-Cell-O pins and bushings are applied wear longer, as do also other parts which suffer from shock and rigorous service when improperly made bushings and pins are used. . . . *Ex-Cell-O offers hardened and ground bushings and pins and expert engineering service to help you obtain better and more economical performance.*

EX-CELL-O CORPORATION • DETROIT

XLO

EX-CELL-O *for* PRECISION

For complete list of standard sizes and other data on railroad hardened and ground steel pins and bushings, send for Bulletin 32301.

I'm working on the railroad
I'm the Lift in every BUDA JACK
. . . I make lifting and lowering, pushing, and pulling . . . easier and quicker!
BUDA LIFT
BUDA
USE ME!

Write for the BUDA jack pocket manual

BUDA

THE BUDA COMPANY, Harvey (Chicago Suburb) Ill.

LANDIS CHASERS ARE EASILY AND QUICKLY REGROUND

A simple grinding operation renews the entire cutting edge and leading feature, retaining, after each grind, the initial accuracy of the chaser.

Avoid overheating, use mechanical rests, check throat and lip rake angles, grind uniformly and only so much of the chaser as is worn and you are assured quality threads and long chaser life.

The Finest Thread Cutting Tool in Industry

12 Features of the LANDIS TANGENTIAL CHASER

1–Permanent throat permits close to shoulder threading throughout life of chasers
2–Rake angle range covers all machinable materials
3–Free cutting condition permits maximum cutting speeds
4–Simple grinding operation renews entire cutting edge and leading feature
5–Line contact with work lessens friction and minimizes thread distortion
6–Leading feature insures thread of accurate lead
7–Lateral absorption of cutting strain reduces vibration and chaser breakage
8–Right and lefthand threading feature reduces chaser equipment
9–Standard chasers thread all diameters with proper chaser holders
10–Interchangeability of chasers lowers operating cost
11–Chaser length provides exceptionally long life and low tool cost
12–Permanent throat gives equal distribution of cut

LANDIS MACHINE COMPANY

WAYNESBORO, PA., U.S.A.

THREADING MACHINERY—THREAD CUTTING DIE HEADS—COLLAPSIBLE TAPS

HOW AND WHY

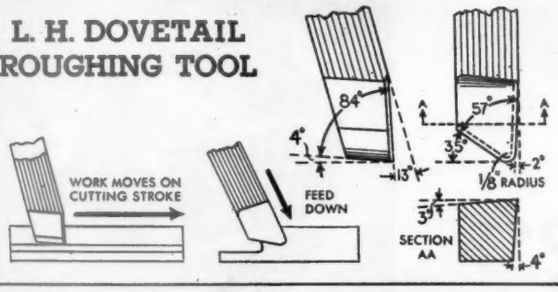
WILLIAMS' TOOLS AID WAR PRODUCTION

GRINDING CUTTERS FOR WILLIAMS' TOOL HOLDERS

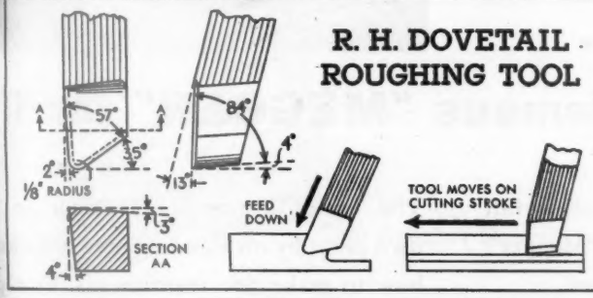
DATA SHEET D, covering the various Shaper tools used in Williams' Holders for machining Cast Iron.

● Williams' Turning-Tool Holders are regularly used for Shaper work. They are made in eight sizes for cutters 3/16" to 3/4" square. Since the cutter channel is broached at a 15° angle, as shown at right, allowance must be made for this fact when grinding cutters. *Grinding* and *applied* angles are given below.

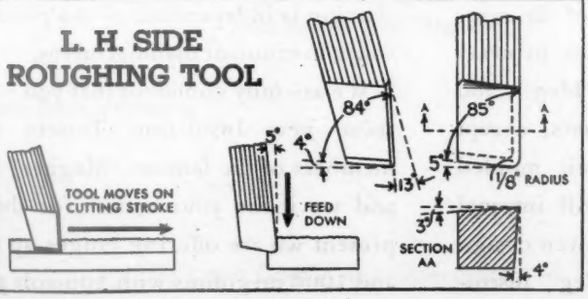
L. H. DOVETAIL ROUGHING TOOL



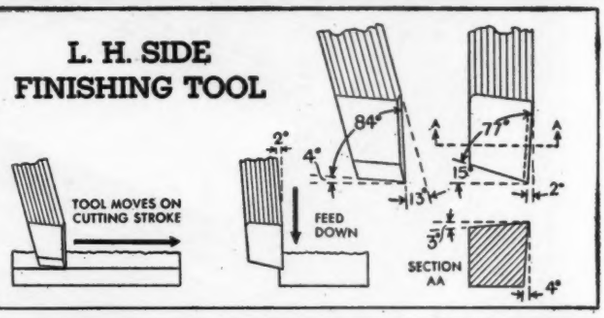
R. H. DOVETAIL ROUGHING TOOL



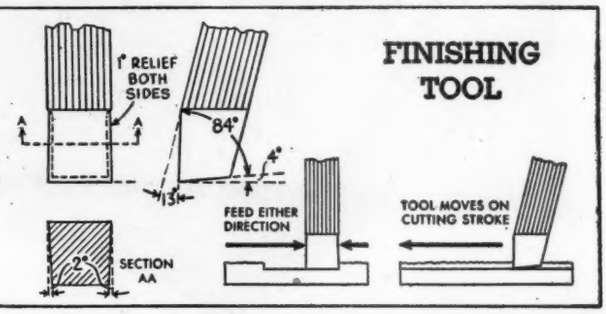
L. H. SIDE ROUGHING TOOL



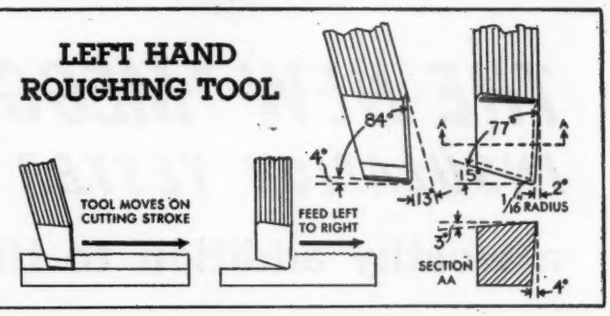
L. H. SIDE FINISHING TOOL



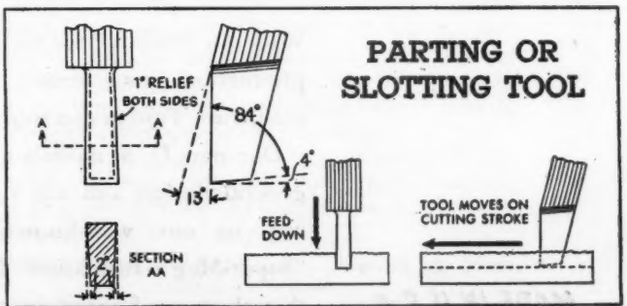
FINISHING TOOL



LEFT HAND ROUGHING TOOL



PARTING OR SLOTTING TOOL



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J. H. Williams & Co., Buffalo 7, N. Y.

Data Sheets A, B and C on this subject have already appeared. Additional Data Sheets on grinding of other cutters for Williams' Tool Holders will follow. Reprints of Data Sheets are available on request.

WILLIAMS

Headquarters for over half a century for DROP-FORGINGS and DROP-FORGED TOOLS

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ALWAYS
READY FOR USE

THE NEW "MEGGER"* INSULATION TESTER . . .

a worthy addition to the famous "MEGGER" family

With our Philadelphia factory now in full production, your needs for "Megger" Insulation Testers can soon be met.

Our new U. S. models are of the same general design and are similar in every way to our well-known "Meg" and "Super-Meg" Insulation Testers, except that they are housed in plastic molded cases instead of aluminum. All internal parts are made to the same proven design and specifications as the "Meg" instruments,—without compromise or substitution of materials. The cases are of high impact strength plastic,—one of the strongest, toughest molding materials available.

The entire instrument is built in our own plant by men and women who know how to make fine instruments. Our production is independent of the products of other instrument manufacturers.

We are fully confident that you will find these new Insulation Testers worthy members of the famous "Megger" family and we invite your orders for them. At present we are offering ranges up to 100 and 1000 megohms with 500-volt generators. We continue to supply various other types and ratings of "Megger" instruments as formerly. Write for new descriptive Bulletin 1735-"X"

MADE IN U.S.A.

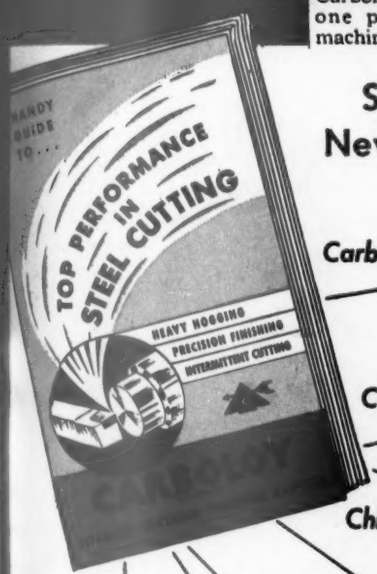
- HAND-CRANKED GENERATOR
- DIRECT-READING OHMMETER
- SIMPLE
- RUGGED
- RELIABLE

*Trade Mark Reg. U. S. Pat. Off.

JAMES G. BIDDLE CO. · 1211-13 ARCH STREET · PHILADELPHIA 7, PENNA.

Guide to Top Performance when Cutting Steel

Turning, boring, facing steel supercharger gears. Carboloy tools eliminate one pass; save 81% machining time.



Send for this New, Pocket-size Manual

Carbide Grade Selection

Correct Cutting Speeds

Chip Breaker Design

Tool Rakes and Angles

Machine Requirements

Use of Coolants

"Do's and Dont's" for Operators

For top performance when you cut steel with carbide tools ★ Cut at high speeds, in general, not less than 200 feet per minute ★ Use feeds not less than .010″ per revolution (for medium and heavy cuts), and preferably .015″ to .025″ ★ Fit correct chip breaker to each job (the ground-in, step-type is usually best) ★ If you use a coolant, provide heavy, continuous stream ★ Keep tools sharp (excessively dull tools cause breakage) ★ Use rigid set-ups; with minimum overhang, and part chucked firmly. These factors are particularly important for best results.

Important, too, is the type of carbide you select. Today, more than 60% of all Carboloy Cemented Carbide produced for machining purposes is used for cutting steel. In leading war plants throughout the nation—you find Carboloy tools giving top performance on all types of steel cutting, ranging from extra heavy jobs to light, high-speed precision finishing.

A new 16-page pocket manual on steel cutting, to help your plant get maximum results, is available free on request. In quantities, for general distribution; if desired.

CARBOLOY COMPANY, Inc., Detroit 32, Mich.
11157 E. 8 Mile Road

Sole makers of the Carboloy brand of cemented carbides
Birmingham, Ala. • Chicago • Cleveland • Los Angeles
Newark • Philadelphia • Pittsburgh • Seattle • Thomaston, Conn.
Authorized Distributors: Canadian General Electric Co., Ltd., Toronto, Canada.
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For Cutting CAST IRON

CARBOLOY

(TRADEMARK) CEMENTED CARBIDES

For Cutting STEEL

FOR HEAVY HOGGING • • • PRECISION FINISHING • • • INTERMITTENT CUTTING

READY FOR

GENERAL MACHN

NILES TOOL WORKS

Offices in

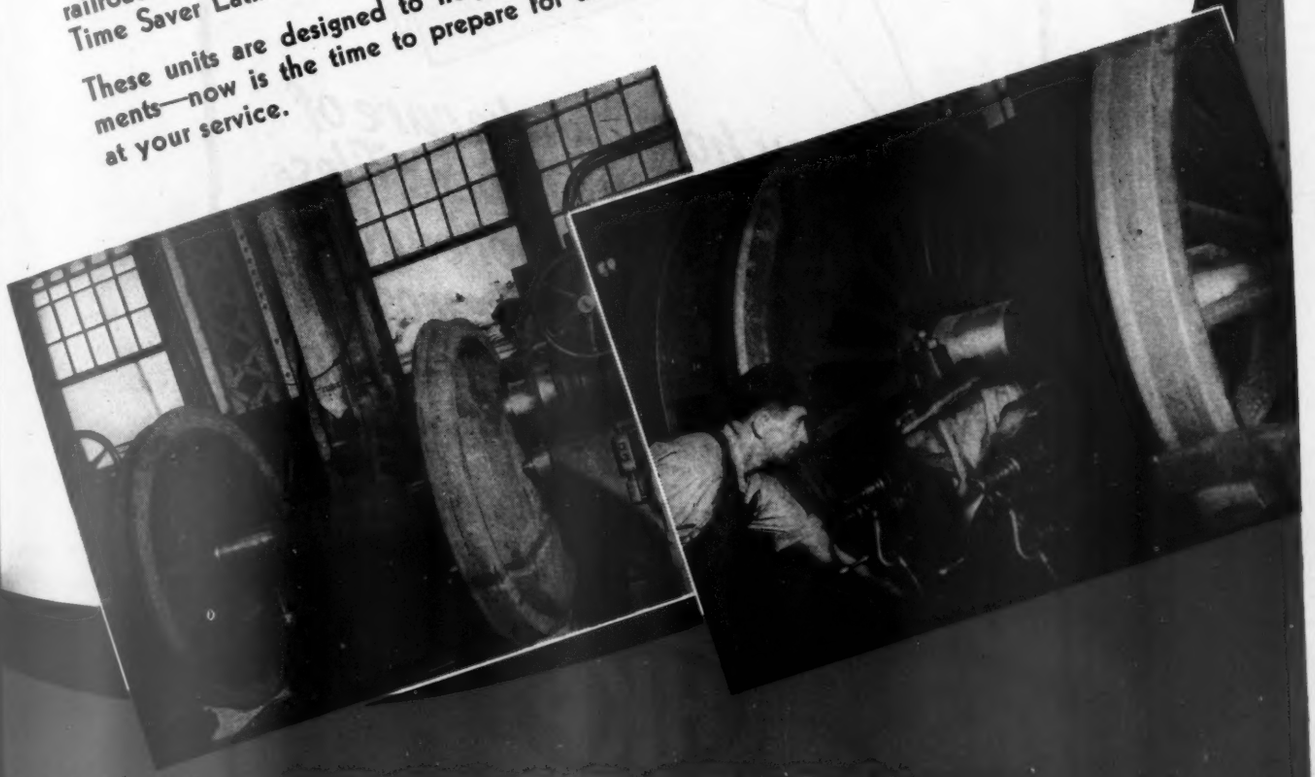
Transportation Front

THE supervisors in locomotive back shops have done a swell job in meeting war time emergency schedules with the tools installed before Pearl Harbor.

Replacement of obsolete units is inevitable—in spite of the war time demands, production in the General Machinery Corporation plants, has now reached the point, where all immediate railroad shop requirements can be supplied.

Many improvements have been made in the complete line of Niles railroad shop tools—Quartering Machines, Journal Lathes, Boring Mills, Time Saver Lathes and other special railroad shop units.

These units are designed to help the railroads meet post war requirements—now is the time to prepare for the future—Niles engineers are at your service.



CHNERY CORPORATION

S DIVISION ★ HAMILTON, OHIO

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Ask for this book

Tells you how to take care of small tools-Bolt Clippers, Files, Taps, Drills, etc. The boiled down facts to help you get the most out of these tools-use, wear, repair and selection. Handy pocket size. Just ask on a post card for— Porter's Tool Maintenance Book it's FREE

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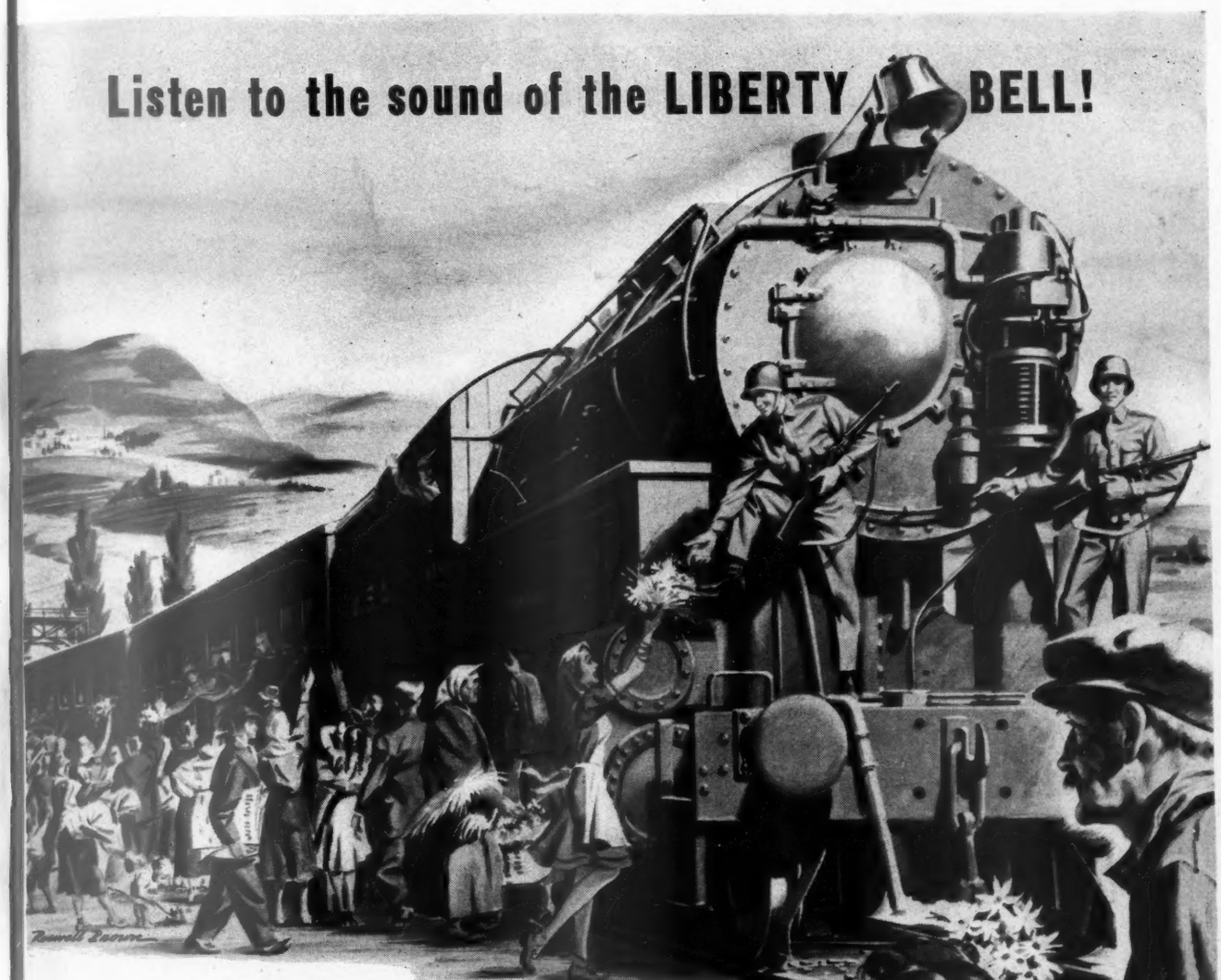
PORTER CUTTERS

BOLT CLIPPERS — AUTOBODY REPAIR TOOLS — PRUNERS

H. K. PORTER, INC., 415 ASHLAND ST., EVERETT, MASS.

Listen to the sound of the LIBERTY BELL!



It's not news that railroad junctions and terminals are primary military objectives. Railroad terminals in Berlin, Dusseldorf and Bremen are even now being blasted by devastating bombing raids to soften Nazi Germany for the invasion of "Fortress Europe."

We've all read of Hitler's characteristic perversion of railroad rolling stock to the transporting of slave labor into the Reich.

. . . and this we know, too . . . someday soon, locomotives are going to roll along the European countryside—carrying freedom to the peoples of oppressed lands . . . carrying freedom in the person of United Nations' fighting men; food from the Americas, and clothing, too.

Then the locomotive bell will ring out across Europe carrying the sound of a new dawn of freedom to men and women everywhere!

Union Asbestos insulations are used by most U. S. railroads to conserve steam—thus save fuel and increase passenger comfort and operating efficiency. U. S. locomotive builders are applying Unarco insulations to all locomotives being built for overseas duty.

INSULATION FOR MARINE, RAILROAD, AVIATION AND INDUSTRIAL USE

UNION ASBESTOS AND RUBBER CO.

OFFICES: CHICAGO, NEW YORK, SAN FRANCISCO
PLANTS: CICERO, ILL., BLUE ISLAND, ILL., PATERSON, N. J.

To make *Good* wheels

BETTER

a.c.f. developed this high-speed wh

As one of the largest producers of chilled tread car wheels, a.c.f. long ago recognized the extreme importance of having its wheels truly concentric with the axle. To this end, it developed for its own use the a.c.f. High-Speed Wheel Grinder.

This simple and efficient device proved most successful. Not only did it afford a speedy and inexpensive means of insuring true concentricity, it also produced a distinctly *better* wheel. It did this by producing a wheel with a smooth ground surface for rail contact. It also afforded a perfect means of detecting any possible imperfections.

Originally developed as merely another of a.c.f.'s special tools and facilities for the production of better railroad equipment, this highly practical a.c.f. High-Speed Wheel Grinder is now used by many railroads in their wheel maintenance work.

Users report the operating cost of the a.c.f. High-Speed Wheel Grinder is insignificant, and savings effected in salvaging wheels taken out of service for 'slid flat', 'out-of-round', 'worn hollow', 'sharp flanges', etc., and in remounting second-hand materials, will cover the purchase price in two or three years use.

a.c.f.

AMERICAN CAR AND FOUNDRY COMPANY

NEW YORK · CHICAGO · ST. LOUIS · CLEVELAND · PHILADELPHIA · PITTSBURGH · ST. PAUL · SAN FRANCISCO

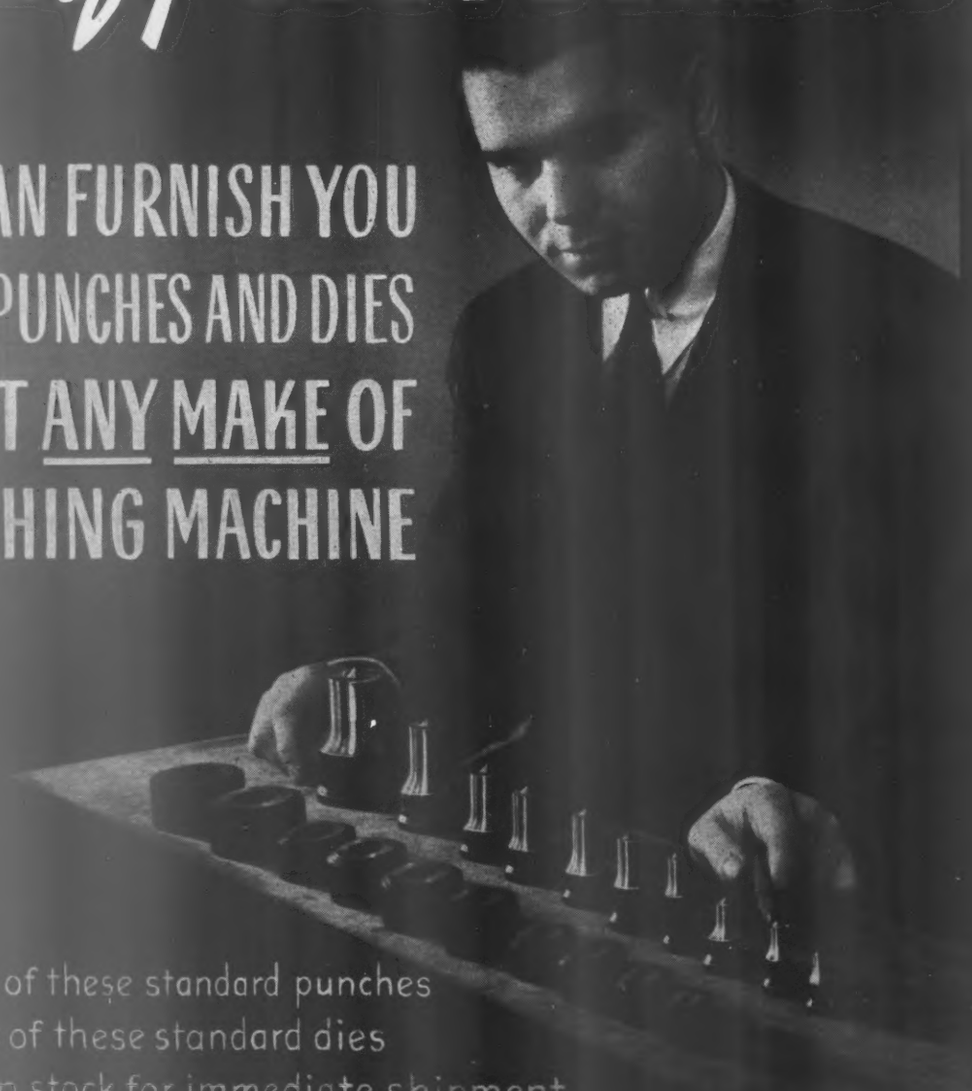
The A.C.F. High-Speed Wheel Grinder finishes mounted pairs of wheels with treads of identical circumference, concentric with the journal, and presenting a perfectly smooth surface for rail contact. The floor to floor grinding time for a pair of mounted new chilled tread wheels is 3 to 4 minutes, and the operation affords a perfect means of detecting imperfections in wheels as furnished, or faulty workmanship in boring, mating, and mounting.

ADVANTAGES

1. Increases wheel life.
2. Lowers maintenance of trucks, brakes, and rails.
3. Reduces train resistance.
4. Reduces vibration.
5. Cuts damage to fragile ladings.

Specify CLEVELAND'S

WE CAN FURNISH YOU WITH PUNCHES AND DIES TO FIT ANY MAKE OF PUNCHING MACHINE



399 sizes of these standard punches
241 sizes of these standard dies
carried in stock for immediate shipment
as shown on accompanying ready reference tag

Write for Small Tool Hand Book

When you need Punches and Dies or other Small Tools such as Chisel Blanks, Coupling Nuts, Rivet Sets, Shear Blades, etc. specify Clevelands and your order will be shipped without delay

Small Tools THE CLEVELAND PUNCH & SHEAR WORKS COMPANY *Cleveland, Ohio*

NEW YORK • CHICAGO • DETROIT • PHILADELPHIA • PITTSBURGH

A. A. R. Approved

the GRIP NUT GROUP . . .

Wherever ladings move on rails, GRIP NUT products will do an outstanding job. Rolling stock and motive power will stay in uninterrupted service with minimum maintenance when GRIP NUT COMPANY products protect vital points.

Exclusive, patented features—strength with minimum weight—simple application—dependable, long service—earned GRIP NUT COMPANY products widespread acceptance by Railroads, Carbuilders and Industries for both new and maintenance work.

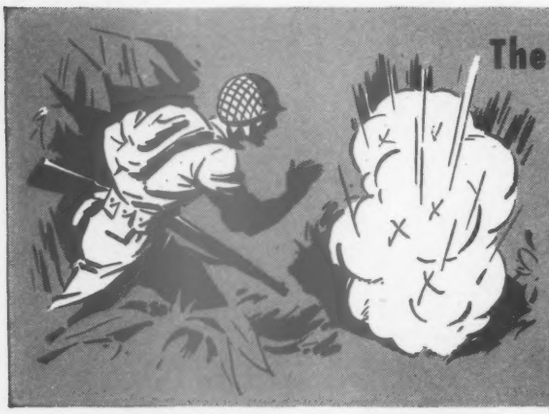
Illustrated literature and complete specifications on all GRIP NUT products supplied upon request.

GRIP NUT COMPANY

310 South Michigan Avenue **CHICAGO 4, ILLINOIS**

serving American Railroads since 1906

Regional Offices: St. Paul, Minneapolis, St. Louis, San Francisco, Cleveland, Chicago, Salt Lake City, Salisbury, N. C., Pittsburgh, New York



The bomb he throws into his own foxhole

Newest weapon of the U. S. A. in combating insects is an "exterminator bomb." Small, light and now standard equipment, it's tossed into foxholes, shell craters—wherever else our boys must spend a night in the open—to disinfect, to clean out insect pests. It's another case of peacetime commercial development meeting a vital wartime need, and it's just . . .

one reason there's no Freon 12 for you

STURTEVANT COOPERATES WITH RAILROADS IN CONSERVING FREON!

Specially skilled men assigned to furnish

EMERGENCY REPAIRS AND REPLACEMENTS

Although there's no way of getting new Freon, there are plenty of ways of losing the Freon you have. In safeguarding existing supplies, Sturtevant offers you fullest cooperation.

Realizing the pressure under which maintenance men are working—and the importance of keeping air conditioned cars on the road—we have set up a special department to repair damaged equipment—or replace it, if necessary, under existing government regulations.

Take advantage of the opportunity to repair condenser and evaporator coils, for example, while this equipment is not in service. If, in inspecting and shutting down these units for winter operation, you find they require attention to prevent loss of Freon when the refrigeration end is put back into operation—send the equipment to us for an estimate on repairs or replacement parts.

Here is the air conditioning equipment Sturtevant is prepared to repair or replace with reasonable promptness:—

CONDENSER COILS ★ EVAPORATOR COILS ★ HEATING COILS ICE WATER COILS ★ CAR FAN UNITS ★ CONDENSER FANS ★ COMPLETE UNITS ★

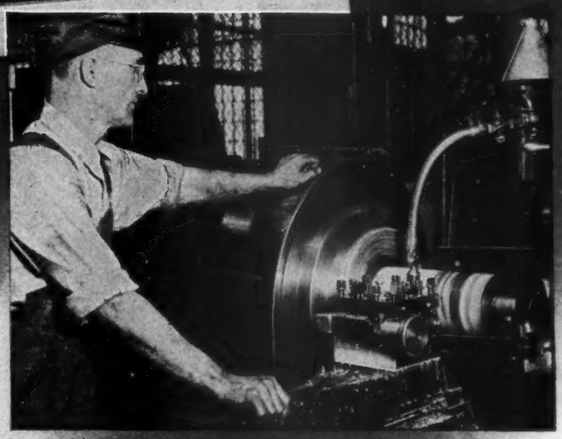
We will gladly work with you in arranging a schedule so that your air conditioning equipment can be taken out and repaired or replaced with a minimum of off-the-road time for the car.

B. F. STURTEVANT COMPANY
Railway Air Conditioning Division
Hyde Park, Boston 36, Mass.

Sturtevant
REG. U. S. PAT. OFF.
Puts Air to Work

A Few Typical Railroad Shop Jobs Produced on Warner & Swasey Turret Lathes

A Small Part Can Play a Big Part in "Keeping 'Em Highballing"



The flexibility of the turret lathe makes it an ideal machine to handle railroad shop jobs. Warner & Swaseys handle hundreds of bar jobs ranging from small cylinder and boiler studs up to the heaviest crank pins; and chucking work, from small brass valves and lubricator parts up to such heavy duty work as cylinder bull rings.

Built-in power, rigidity and accuracy give Warner & Swaseys the ability to do every job well.

Time saving today in railroad repair and maintenance work is more important than ever.

Spring Rigging Pins, Frame Bolts, Guide Bolts, Engine Truck Pins, Crank Pins, Knuckle Pins, Wrist Pins, Throttle Rod Ends, Feedwater Pump Valves, Stoker Parts, Studs, Superheater Details, Bushings, Equalizer Bolts, Lubricator Parts, Oil Cups, Grease Plugs—these are only a few of the many railroad jobs that can be handled at time-saving speed on Warner & Swasey Turret Lathes.

The advantages of being able to take combined or multiple cuts on so many turning jobs greatly reduce operating time. For example, the action photo above shows a locomotive crank pin being made from 8″ axle stock on a 4A Warner & Swasey with a 45% time saving over former method.

WARNER & SWASEY Turret Lathes *Cleveland*

YOU CAN TURN IT BETTER, FASTER, FOR LESS...WITH A WARNER & SWASEY

LIFE WITH FATHER TIME

FEW industries take such a beating from Father Time these days as the railroads. Forced to do double duty *and then some* under crushing wartime pressure, they have drafted all available rolling stock.

Wear hits the double-quick under such strain . . . a pace that can be slowed only by *the best* of maintenance cleaning and care.

Wyandotte Railway Cleaning Products are trusted standbys. Famed for speed, thoroughness, economy, they get after the hardest oil, grit, grease and carbonized deposits, pull no punches in the toughest back shop work. Remember — whatever your cleaning problem, there's a Wyandotte product tailored for it.

A staunch ally in the railroads' war on deterioration, the Wyandotte Representative is always ready to help you. Call him in—today!

Wyandotte

SERVICE REPRESENTATIVES IN 88 CITIES

WYANDOTTE CHEMICALS CORPORATION
J. B. FORD DIVISION • WYANDOTTE, MICHIGAN

• *Wyandotte Chemicals Corporation consolidates the resources and facilities of Michigan Alkali Company and The J. B. Ford Company to better serve the nation's war and post-war needs*

The One Constant Ingredient

Every Railway V-Belt that is made by Dayton Rubber contains one ingredient which never varies. Wartime restrictions can never affect it. It is mixed into every compound of natural or synthetic rubber. It is woven into every inch of fabric, cord or wire destined for Dayton V-Belts.

This constant ingredient is the sum total of Dayton Rubber's 37 years of continuous development, processing and application of rubbers and fabrics of every type. It is the residue of thousands of man-hours of patient research, practical testing and controlled manufacturing ability.

This constant ingredient is the technical knowledge and experience that you would naturally expect to find built into every V-Belt by Dayton, the world's largest maker and pioneer of Railway V-Belts for Car Lighting, Diesel Locomotive and Air-Conditioning Equipment.

So whether the Railway V-Belts you use are made of today's synthetics or tomorrow's "X" materials need not concern you — so long as they bear the name which stands for Technical Excellence over the years.

THE DAYTON RUBBER MFG. CO.
DAYTON 1, OHIO

Photo shows Recovery Area in the First Government Dual-Unit Type Synthetic Rubber Production Plant—of which Dayton is one of the operators. Here unused Hydro-Carbons are stripped from the Latex for Return to Process.

V-Belts by Dayton Rubber

FOR CAR LIGHTING, DIESEL LOCOMOTIVE and AIR CONDITIONING

KEEP BACKING THE ATTACK—BUY MORE WAR BONDS

Speed work
thru the Repair Shop

Give your repair shop a "lift"—with Whiting Electric Portable Jacks. They speed up work in scores of service operations where high lifting helps accessibility. Ideal for removing wheels and trucks, repairing axle-connected generators and motors, and scores of other regular maintenance operations.

Here is low investment equipment that pays big dividends in time and labor saved. Engineered to handle coaches, tenders, Diesel, and electric locomotives. A letter will bring full information promptly. Whiting Corporation, 15609 Lathrop Ave., Harvey, Illinois.

about priorities . . .

Whiting will gladly assist you in preparing applications to assure the highest possible preference rating for your orders. We invite you to use this service.

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RAILROAD MAINTENANCE EQUIPMENT

DROP PIT TABLES • LOCOMOTIVE HOISTS • HIGH-LIFT JACKS • LOCOMOTIVE SPOTTERS
CINDER CONVEYORS • TRANSFER TABLES • CROSSOVER BRIDGES

SLEEVE BRAKE HEAD

CONSERVES MATERIALS

DECREASES BRAKE BEAM FAILURES

INCREASES TENSION-ROD LIFE

REDUCES TRAIN DELAYS

Over 2,500,000 Sleeve Heads in service is evidence of their value

CHICAGO RAILWAY EQUIPMENT CO.

McCormick Building, Chicago

STOP 'EM BOUNCING
CONSERVE BOLSTER SPRINGS

STYLE A-6-A
VOLUTE
SNUBBER
SPRINGS

The Spring Coil is also the friction shock absorbing element.

Photo by U. S. Army Signal Corps

★ ***Uncle Sam uses VOLUTE Springs on many Tanks!***

HOLLAND COMPANY 332 SO. MICHIGAN AVE., CHICAGO

HAND ON THE THROTTLE
. . . EYES ON THE ROAD

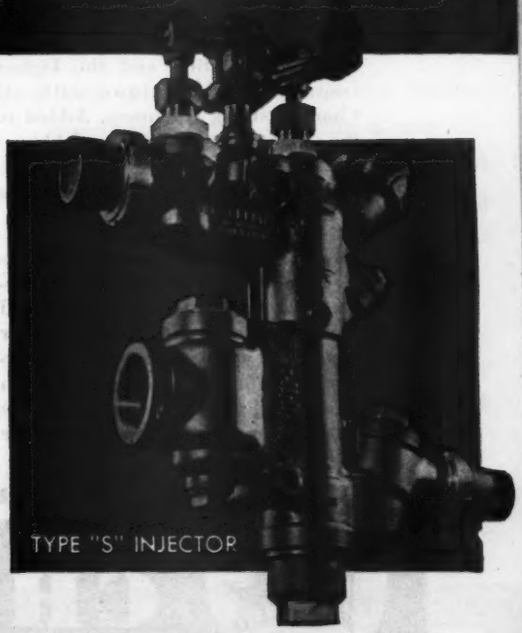
There's no groping and fumbling for the right valve when your locomotive is equipped with a

SELLERS TYPE "S" INJECTOR

A single lever—simple as an automobile handbrake—controls all functions of the injector . . . starting, stopping, regulating capacity and overflow.

And here are other good reasons why this modern appliance opens a new field in the operation, convenience and safety of locomotive injectors . . . Lowest cost for injector renewals and labor . . . Minimum loss of water when starting and stopping . . . No water hammer or bulging steam lines . . . Located far above the rails, free from roadbed hazards . . . Permits complete drainage of water tank when necessary.

In other words, Sellers has overcome the disadvantages of the old style injectors to such an extent that they are now standard equipment on America's major railroads . . . Glad to send you complete technical information . . . Wm. Sellers & Co., 1630 Hamilton St., Philadelphia.



TYPE "S" INJECTOR

SELLERS PRECISIONEERING SINCE 1848

A Self-Contained Pneumatic Forging Hammer for Railroad Shops

The Chambersburg Pneumatic Forging Hammer has a greater forging output than any other hammer of its type. More actual forging per blow is accomplished, due to the heavier anvil construction and the higher impact speeds unique with all Chambersburg Hammers. Added to the advantage of more powerful blows is that of greater rapidity of blows, which permits working the forging at higher temperatures.

The Chambersburg Pneumatic Hammer is of the self-contained type, having a compressor piston cylinder and ram cylinder in which a compressor piston and a ram operates. In operation the ram is driven up and down by a flexible air force, created by the compressor piston. The compressor piston is driven by an electric motor of high speed through two stage speed reduction gearing.

The hammer can be started instantly and strikes a constant number of blows heavy or light at the will of the operator. As soon as the motor is up to speed the hammer is ready to operate. "Squeeze" or "hold-down" is provided by a setting of the operating lever latch.

As the compressed air immediately is replaced from the compressor cylinder to the ram cylinder, air of increased temperature, received during the process of compression, is used in operating the ram. This is the most efficient method and almost perfect expansion of air is attained.

Chambersburg Pneumatic Hammers are made in three types:

1. One Piece, having the anvil integral with the frame for installations such as on shipboard and where deep foundations are impractical. Sizes rated at 200 lbs. and 300 lbs. are so constructed.

2. Solid Frame, having separate anvils and a one-piece frame of rigid, reinforced construction. Sizes 300 lbs. and 500 lbs. are of one-piece, or solid frame construction.

3. Two Piece Frame, having separate anvils, and with the frame scientifically and rigidly mounted on a base plate which encircles the anvil. Sizes 750 lbs. and upward are so constructed.

All are constructed with more generous working space than formerly available.

A new bulletin No. 1275 is now available. Write for your copy.

CHAMBERSBURG ENGINEERING CO., CHAMBERSBURG, PA.

ARMY E NAVY

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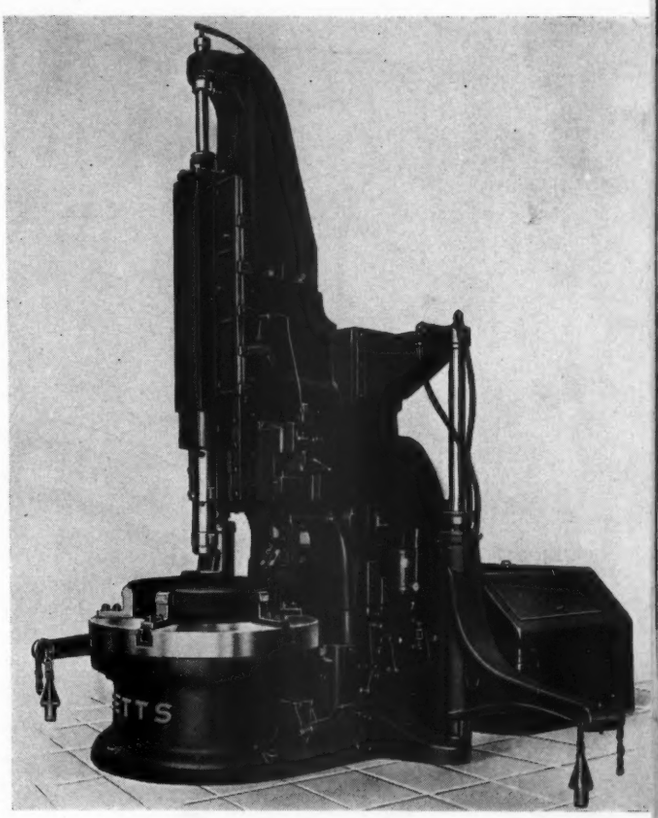
CONSOLIDATED

WHEEL and AXLE MACHINES



BETTS HYDRAULIC FEED CAR WHEEL BORER

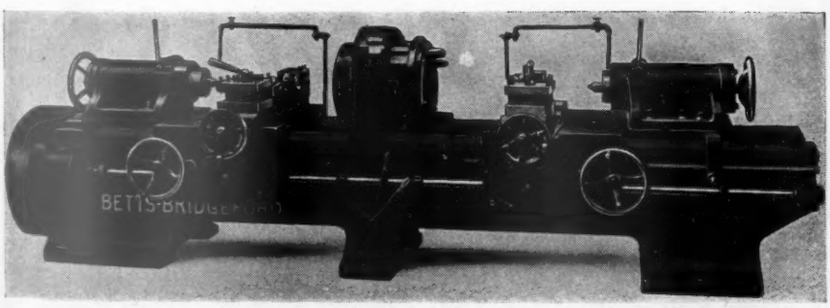
This machine is designed for rough and finish boring and chamfering cast iron and steel car wheels. After wheel is loaded and machine is started, the cycle of operation is automatic including rapid traverse approach, return to starting position and stop.

These machines are turning out work on a production basis in many important railway shops. For further information send for Bulletin 6103.

BETTS-BRIDGEFORD

Heavy Duty Center Drive Axle Lathe

The Axle lathe shown below may be equipped with opposed burnishing arrangement which equalizes the pressure between the front and rear burnishing rollers. It may also be furnished with hardened and ground flat steel ways and carriage bearing surfaces lined with bronze shoes.



When equipped with turret tool holders, the turning and burnishing operations are accomplished by moving rear tool holder out of the way and rotating turret to bring the proper tool into position.

These and other important features make Betts-Bridgeford Heavy Duty Center Drive Axle Lathes highly efficient shop units.

BETTS • BETTS-BRIDGEFORD • NEWTON • COLBURN • HILLES & JONES • MODERN

CONSOLIDATED
MACHINE TOOL CORPORATION
ROCHESTER, NEW YORK

SCRAM-YOU SISSIES!

Harcote's workin' on the railroad now! — licking wear and abrasion wherever they meet! For here's an electrode that means business . . . the business of hard surfacing parts like stoker screws, gears, etc., to keep them on the job.

Protecting softer steels against abrasion and wear is Harcote's way of keeping the rolling stock *rolling*. Easy to work, Harcote goes on smoothly and places a weld that's tough, hard and long lasting. Harcote is used on carbon steel, low alloy and high manganese surfaces. See your P&H representative for information and procedures on this and other P&H Alloy Electrodes. Or write us.

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P&H Also Builds a Complete Line of A.C. and D.C. Arc Welders. Write for Literature.

General Offices and Factory:
4607 W. National Ave., Milwaukee 14, Wis.

ARMY E NAVY

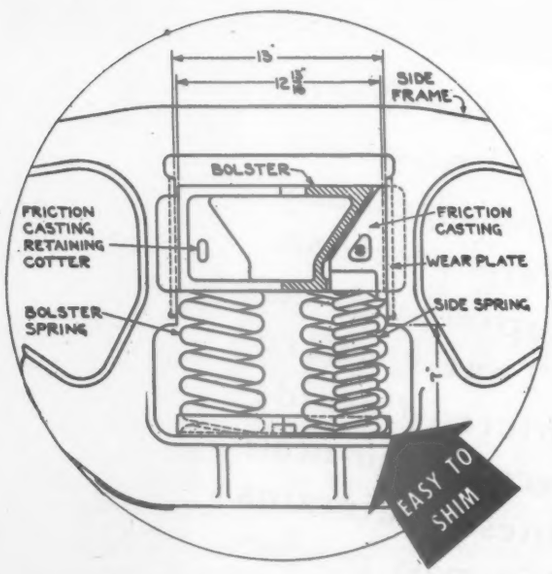
Another New Star has been Added to P&H's Army-Navy "E."

HARNISCHFEGER
CORPORATION
WELDING ELECTRODES • MOTORS • HOISTS P&H ELECTRIC CRANES • ARC WELDERS • EXCAVATORS

Canadian Distribution: The Canadian Fairbanks-Morse Company, Ltd.

FIRTHITE
SINTERED CARBIDES
FOR UNIFORM
PRECISION
WAR'S "appetite" for interchangeable parts knows no bounds. Since interchangeability depends upon **uniform precision**, tools must **stay** sharp on long runs or long cuts.—That's where FIRTHITE Sintered-Carbide Cutting Tools excel. Their near-diamond hardness maintains **uniform precision** in mass production and on hard materials.
ARMY-NAVY E
STEEL COMPANY
Offices: McKEESPORT, PA. NEW YORK - HARTFORD - PHILADELPHIA
CLEVELAND - DAYTON - DETROIT - CHICAGO - LOS ANGELES

BARBER STABILIZED TRUCKS



Over 64,000 Barber Stabilized Car Sets Now Giving Satisfactory Service on 44 Roads and Private Car Lines

Insure Safe, Smooth Riding

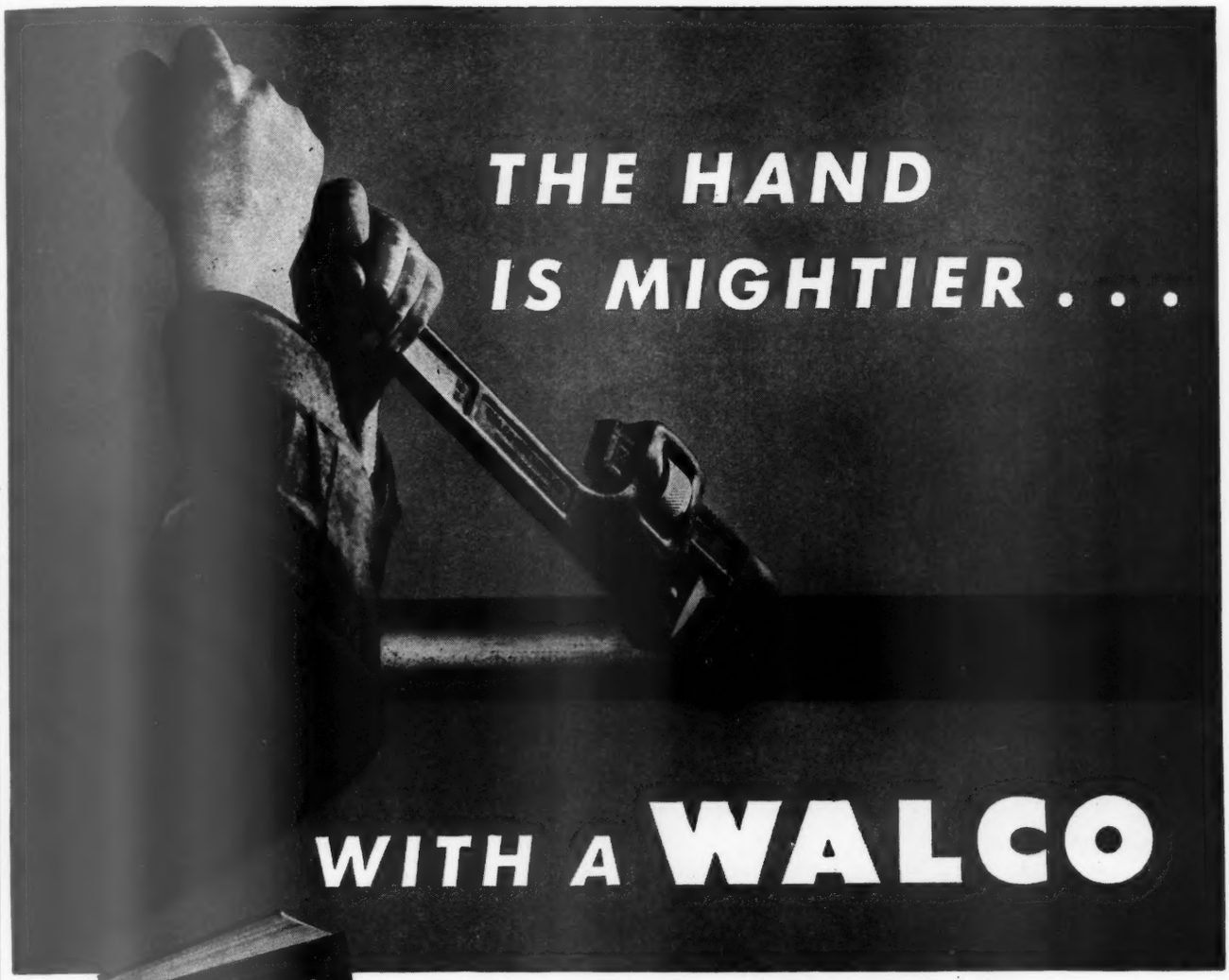
ONE of the outstanding features of Barber Stabilized Trucks is their smooth riding performance, regardless of whether cars are lightly laden or travelling with full load.

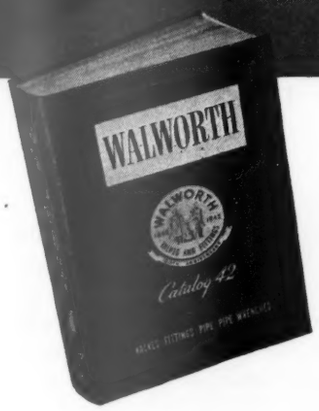
Barber Stabilized Trucks prevent excessive compression and recoil of spring nests by means of constant pressure of friction castings against wear plates in the columns of the side frames. As the load on the bolster is applied it forces the friction castings downward on the side springs thereby exerting increasing pressure outward against the hardened steel wear plates, producing just the right amount of damping and shock absorbing action.

The surface ground friction castings have large area contact producing a pressure of less than 20 pounds per square inch with light weight of car body, increasing proportionally with the load to about 80 pounds under normal full load. This low unit pressure promotes long service and gives an action that is soft, certain and highly effective.

Specify Barber Stabilized Parts when ordering trucks for new and rebuilt cars.

STANDARD CAR TRUCK COMPANY
332 SOUTH MICHIGAN AVENUE CHICAGO, ILLINOIS





You'll find pertinent information on Walworth's complete line of valves, fittings, pipe, and pipe wrenches in the new Walworth Catalog 42. Included are 78 pages of practical engineering data that simplify valve selection and make piping layouts easier. Write, on business stationery, for your free copy. Address: Walworth Company, 60 East 42nd Street, New York, N. Y., Department N.

Every part of a Walco wrench is designed and built for strength and safety of operation. The Walco grips and holds no matter how hard you pull. All parts of this modern wrench are **made entirely of steel.** The handle and both jaws are made of drop forged steel. The housing and handle are forged from a single piece of steel. Both jaws are carefully machined, and all parts are heat treated to provide toughness, uniformity, and strength. The cross locked lower insert jaw, which is an exclusive Walco feature, makes it easy to remove a worn lower jaw and insert a new one. The spring may be quickly and easily replaced without the use of tools. These features prolong the life of the wrench indefinitely.

Users everywhere testify to the fact that Walco is the world's strongest wrench, the safest, and by far the least expensive to use. It is made by Walworth Company, manufacturers of valves and fittings for more than a century.

BOSTON WORKS
KEWANEE WORKS

WALWORTH
valves AND fittings

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

Increase HIS ABILITY

Give Him AIR TOOLS

Every worker has the desire to produce. Give him the proper tools and he'll do it.

Any portable power tool will increase the output of the operator's hands, but a lighter, smaller AIR tool of comparable power will *further* increase his production.

Ingersoll-Rand AIR tools are wanted by men on production lines. Here's why . . . . . .

LIGHT WEIGHT . . . *Air tools are lighter in weight* than other types of portable power tools, and are about *one-half the size.* This is an important factor in reducing operator fatigue.

FLEXIBILITY . . . *Air tools give maximum power immediately.* Starting and stopping are practically instantaneous. This speeds up repetitive operations. *Regulation of power* permits the use of the tools on many kinds of materials and on many types of operations.

DURABILITY . . . *Trouble-free service* is assured by the sturdy construction of AIR tools. AIR motors cannot be damaged by overloading.

POWER . . . *Air tools have more power per pound,* thereby enabling the operator to produce more work with less effort.

SAFETY . . . *Air tools are safe* because they are easy to handle and are simple in design. Compressed air is the safest medium for the transmission of power for portable tools.

Give the man on your production line every possible help! . . . GIVE HIM AIR TOOLS!

Ingersoll-Rand

11 BROADWAY, NEW YORK 4, N. Y.

8-350

COMPRESSORS • TURBO BLOWERS • ROCK DRILLS • AIR TOOLS • CONDENSERS • DIESEL ENGINES • CENTRIFUGAL PUMPS

Helping to Keep 'Em Rolling

The splendid record being established by the American Railroads means that Motive Power is "coming thru" in spectacular fashion.

"Falls Hollow" Staybolts are contributing their share to this all-time performance record by furnishing long and carefree service; with each and every staybolt standing guard to warn of failure long before the danger point is reached.

"Falls Hollow" Staybolt iron bars can be furnished in approximately 16 ft. lengths, offering potentially any type and length hollow staybolt you may require — or we can supply you with blank, headed or finished threaded staybolts ready to apply.

"Make every staybolt Hollow and be SURE"

FALLS HOLLOW STAYBOLT CO.

CUYAHOGA FALLS, OHIO

Speedy, Dependable S

Baldwin-Westinghouse

Diesel-Electric Locomotives

Baldwin-Westinghouse Diesel-Electric switching locomotives will help speed car movements through yards and terminals — will help prevent delays on the main lines.

Product of two pioneer companies in the railroad field, Baldwin-Westinghouse diesels are engineered and built for dependability and economy of operation. They are rugged enough to stand up under the most severe operating conditions. Accessibility of equipment facilitates easy inspection and maintenance.

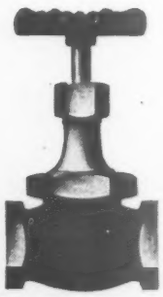
e Switching Service

THE **BALDWIN**
LOCOMOTIVE WORKS, PHILADELPHIA

Westinghouse
ELECTRIC & MANUFACTURING CO., EAST PITTSBURGH, PA.

Lunkenheimer Valves

Vital Helps to Industry's Needs



Bronze "Renewo"
200-300 lb. S.P.

Bronze "N-M-D"
Non-Metallic Disc
150 lb. S.P.

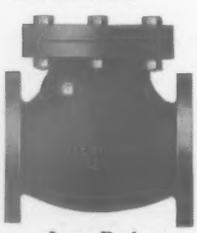
Bronze Gate
Double Wedge Disc
125-150 lb. S.P.

Bronze Gate
Single Wedge Disc
125-300 lb. S.P.

Iron Body Gate
125-250 lb. S.P.

Iron Body
"King-clip" Gate
150 lb. S.P.

Bronze Regrinding
Swing Check
200-300 lb. S.P.



Iron Body
Swing Check
125-250 lb. S.P.

Illustrated are a few of the many types of Lunkenheimer Valves helping to produce vitally needed equipment for the Army, Navy, Maritime Commission, Air Force and Transportation as well as other war agencies.

They're part of the complete line of valves made by Lunkenheimer for every industrial process—of bronze, iron, steel and corrosion-resistant alloys—from tiny needle types to massive power-plant valves—for 125 to 2500 lb. S.P.

A further help is Lunkenheimer's nation-wide distribution through leading supply houses. Wherever there's war activity there's a local Lunkenheimer distributor serving it.

ESTABLISHED 1862

THE LUNKENHEIMER CO.

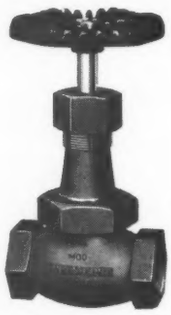
"QUALITY"

CINCINNATI, OHIO, U. S. A.

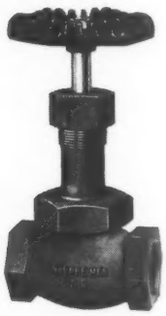
NEW YORK CHICAGO
BOSTON PHILADELPHIA

EXPORT DEPT. 318-322 HUDSON ST., NEW YORK

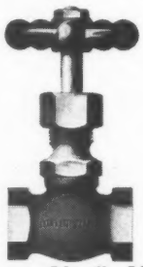
Ask for Catalog 78 and the Guide for selecting Valves, Boiler Mountings and Lubricating Devices.



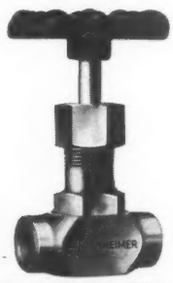
R. R. Blower & Throttle
300 lb. S.P.



A.A.R.
300 lb. S.P.

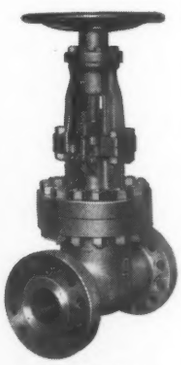


Bronze Needle Valve
200 lb. S.P.

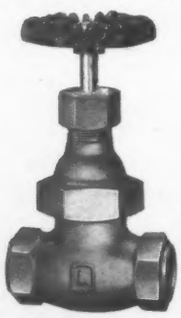


Steel Needle Valve
3000 lb. W.O.G.

Iron Body Globe
125-250 lb. S.P.



Steel Gate
150-2500 lb. S.P.



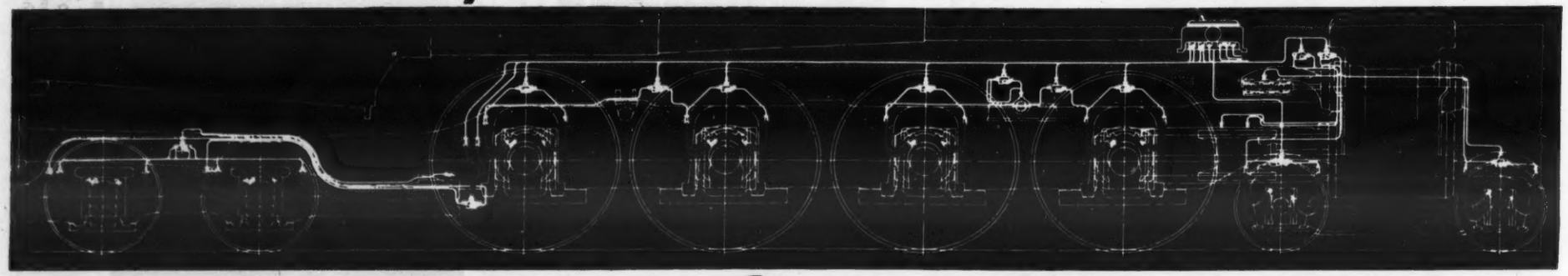
Steel Globe
Bonnet-Thread-Bushing
600 lb. S.P.

Steel Check
150-2500 lb. S.P.

BRONZE, IRON, STEEL AND CORROSION RESISTANT ALLOY VALVES, 125 TO 2500 LB. S.P.; BOILER MOUNTINGS, LUBRICATING DEVICES, AIRCRAFT FITTINGS

SPECIFY

Flex-O-Tube High Pressure Hydraulic Hose Assemblies

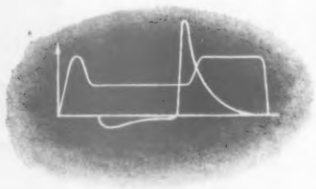


For Efficient Chassis Lubrication

HIGH operating costs due to wear and maintenance of locomotive running gear parts are largely overcome when Flex-O-Tube Hydraulic Hose Assemblies are installed to connect the vital moving parts with the oil distributing system. These Hose Assemblies provide a rugged, weatherproof, flexible tubing, capable of withstanding the high pressure necessary to efficiently lubricate with oils of high viscosity. A typical application is shown above (Courtesy of the Nathan Mfg. Co.) and besides these locations, Flex-O-Tube Assemblies are used for lubricating truck center plates, hinge pins, equalizers, buffers, link trunnions and any other moving part.

FLEX-O-TUBE COMPANY
Detroit Lafayette and Fourteenth Streets Michigan

HELPING TO SOLVE TODAY'S WARTIME PRODUCTION PROBLEMS



the problem of spot-welding heavy gauges

ON ALUMINUM AND LIGHT ALLOYS

It is not generally recognized that the spotwelding of heavy gauge aluminum on a production basis is being successfully accomplished today. While most generally used in the aircraft industry, builders of Railway and Marine equipment will be quick to realize the important advantages of this fabricating method.

Pioneered and developed by Sciaky, the Stored Energy Principle and Variable Pressure Cycle are factors in the successful welding of heavy gauges. The extremely high current requirement is compensated for by the use of Stored Energy, which effects high power factor, uses less current and balances the three-phase supply.

Variable Pressure, another exclusive Sciaky feature, insures spot welds of sound metallurgical quality by ironing out irregularities in the metal, reducing pressure to increase electrical resistance during the flow of current, and finally, "forging" the metal after the weld. The tremendous pressure required is obtained by the use of special heavy duty heads, capable of operating on both Variable and constant pressures. A maximum pressure of 12,000 lbs. is possible.

Write for details. Sciaky experience in the field of Resistance Welding can solve your welding problems, for both the light metals and special steels and armor plate.

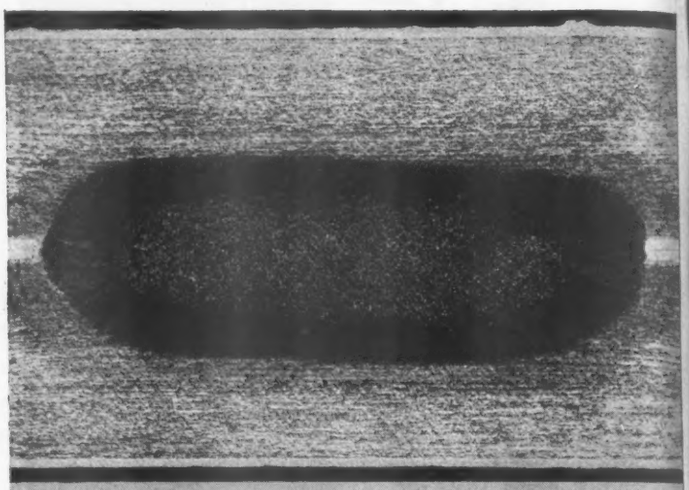
★ ★

TYPE PMCR2S-5 SCIAKY ELECTRIC RESISTANCE ROCKER ARM WELDER, with built-in rectifier, welding 70 spot welds per minute on two sheets of aluminum alloy of .040" each. Welding capacity: from two thicknesses of .016" in aluminum alloys up to and including .080".

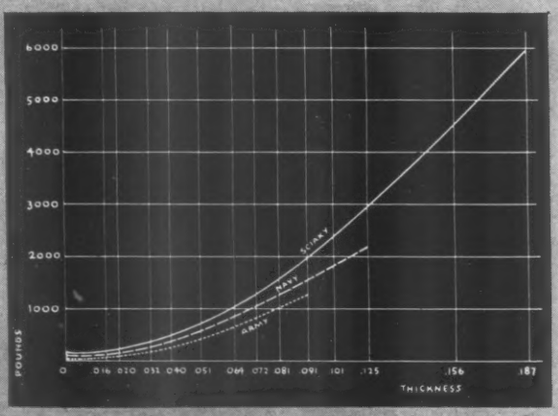
SCIAKY BROS.

Manufacturers of a Complete Line of A.C. and D.C. Electric Resistance Welding Machines.

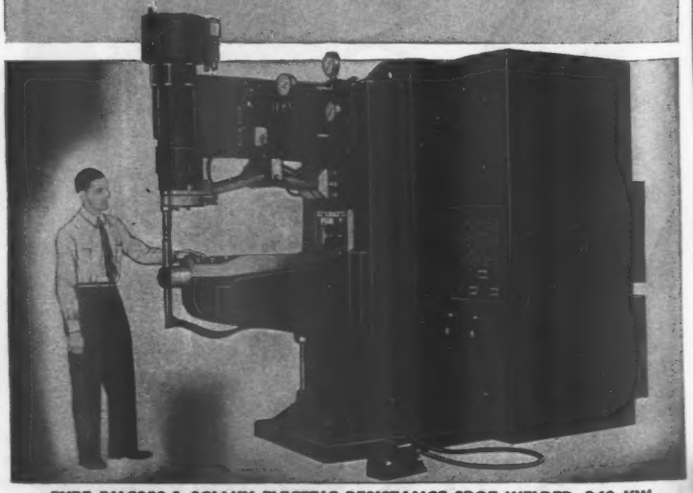
4915 W. 67TH ST. • CHICAGO, ILLINOIS



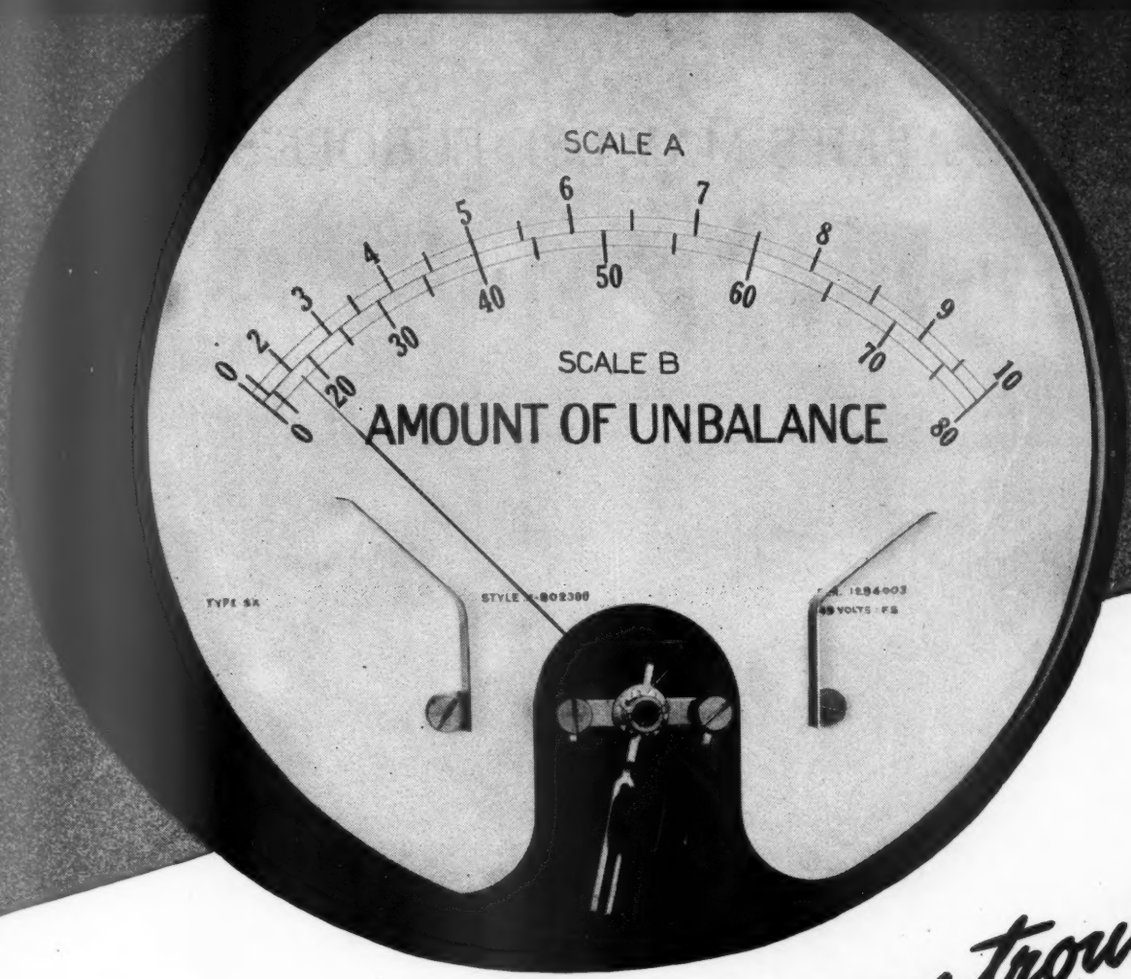
UNRETOUCHED MACROPHOTO of a typical Sciaky spot weld on .156" plus .156", 24ST Alclad at 14X Mg., indicates the weld nugget of proper penetration, and a central zone of uniform cast structure surrounded by an even columnar zone. Good grain structure with no porosity and the absence of cracks is also evident.



A comparison of Army and Navy Minimum Shear Test Values and the range of Sciaky Machines.



TYPE PMC05S-1 SCIAKY ELECTRIC RESISTANCE SPOT WELDER, 240 KW. Welding capacity: aluminum and other alloys or corrosion resisting steels in thicknesses of from .040" plus .040" minimum up to and including .187" plus .187" maximum. Speed: 40 spot welds per minute on two thicknesses of .040" of light alloys.



This hand puts a finger on trouble

Try to elude this sensitive hand, you gremlins of vibration! You'll be caught—isolated—magnified as much as 1,600,000 times. And your measure will be taken.

The pre-testing of high-speed rotating parts is but a simple meter reading with Gisholt Dynetric Balancing Machines. It's done in a few seconds—the most important seconds in the life of any rotating part. For it is here that unbalanced forces are eliminated to prevent vibration, noise, and excessive wear.

GISHOLT MACHINE COMPANY

1293 East Washington Avenue • Madison, Wisconsin

Look Ahead . . . Keep Ahead . . .
With Gisholt Improvements

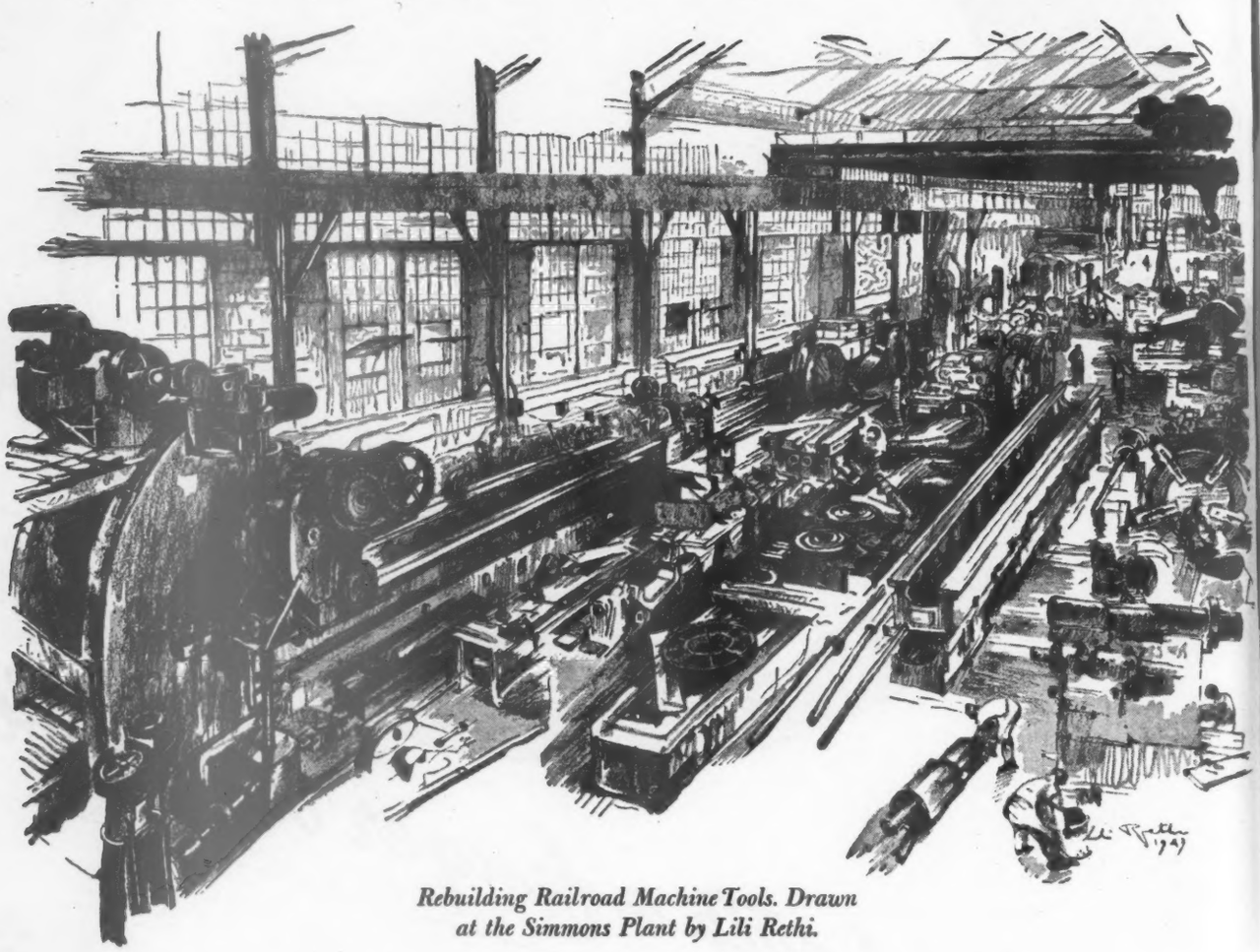
DYNETRIC BALANCING MACHINES make a simple routine of assuring long life in this department. The girl operator accurately *locates* and *measures* the unbalance, and *makes the necessary corrections.* Literature on Dynetric Balancing will be sent upon request.

GISHOLT

At Gisholt, the Army-Navy "E" and the Treasury Flag fly side by side

RRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES

SO THE ALLIES MAY USE EUROPE'S RAILROADS



Rebuilding Railroad Machine Tools. Drawn at the Simmons Plant by Lili Rethi.

UNENDING TARGET of Allied airmen and underground sympathizers since war's beginning have been the railroads of Europe. To halt the flow of Nazi troops and supplies, terminals, freight trains and railroad shops have been bombed, dynamited and wrecked at every opportunity.

Because these same railroads are equally vital to the Allies as supply lines for the penetration of Hitler's Fortress, equipment for restoring them to operating condition is high on the vast list of materiel carried by invasion barges and ships. This means all types of heavy machine tools—railroad wheel lathes, planers, boring mills, among others.

Every available machine tool suitable for this purpose is being unearthed. Inasmuch as our own railroads, handling the heaviest transportation loads in their history, require similar equipment in great amounts, many of the machine tools acquired for the invasion of Europe were old and rundown. *Engineered Rebuilding* by Simmons, however, restored them to good operating condition.

Here, then, is just one example from many illustrating the complex nature of this Global War, the seemingly unending requirements. Thousands of miles behind the battle lines the materiel must be planned down to the last detail.

SIMMONS MACHINE TOOL CORPORATION
1825 North Broadway, Albany 1, N. Y.

SIMMONS *Engineered* REBUILDING

The Extra Men You Need ARE ON THE JOB . . .

and the Simplest Fastening Method will help you find them

When you cut the man-hours required on fastening jobs by one-third or more, you'll have men available for other work – men you badly need to meet today's "hurry-up" schedules for car building and repairs.

Savings of 25 to 50 percent of fastening time are commonplace when P-K Self-tapping Screws replace other fastening methods. There's no simpler way to make fastenings – just drill or punch holes, and drive in Self-tapping Screws. You eliminate the tapping and tap maintenance needed for machine screws. You avoid the slow nut-running needed for bolts. You save much of the time lost welding or riveting in hard-to-reach places. And fastenings made with P-K Self-tapping Screws are usually *stronger!*

Change to Self-tapping Screws Overnight. No special tools or skilled help are required. Whether you're working with light or heavy steel, cast iron, aluminum, brass, or plastics, there's a P-K Self-tapping Screw for the job.

Call in a P-K Assembly Engineer. He can help you with your fastening problems. And, remember, he recommends P-K Self-tapping Screws only when they will do the job better, in less time, at lower cost. If you prefer, mail a brief description of fastenings for recommendations. Parker-Kalon Corp., 194-198 Varick St., New York 14, N. Y.

SELF-TAPPING SCREWS FOR EVERY METAL AND PLASTIC ASSEMBLY

PARKER-KALON

Quality-Controlled

SELF-TAPPING SCREWS

Give the Green Light • to War Assemblies

In the maintenance shops of the Grand Trunk Railroad at Battle Creek, Michigan, a Type HD-247218-A Box Furnace, as shown, is used for the critical drawing of engine springs and other parts. Other Hevi Duty furnaces are used for carburizing, hardening and subsequent heat treating. The flexibility and accuracy of these furnaces have done much to keep rolling stock maintenance at a low cost.

SEND FOR BULLETINS HD 341 and 441

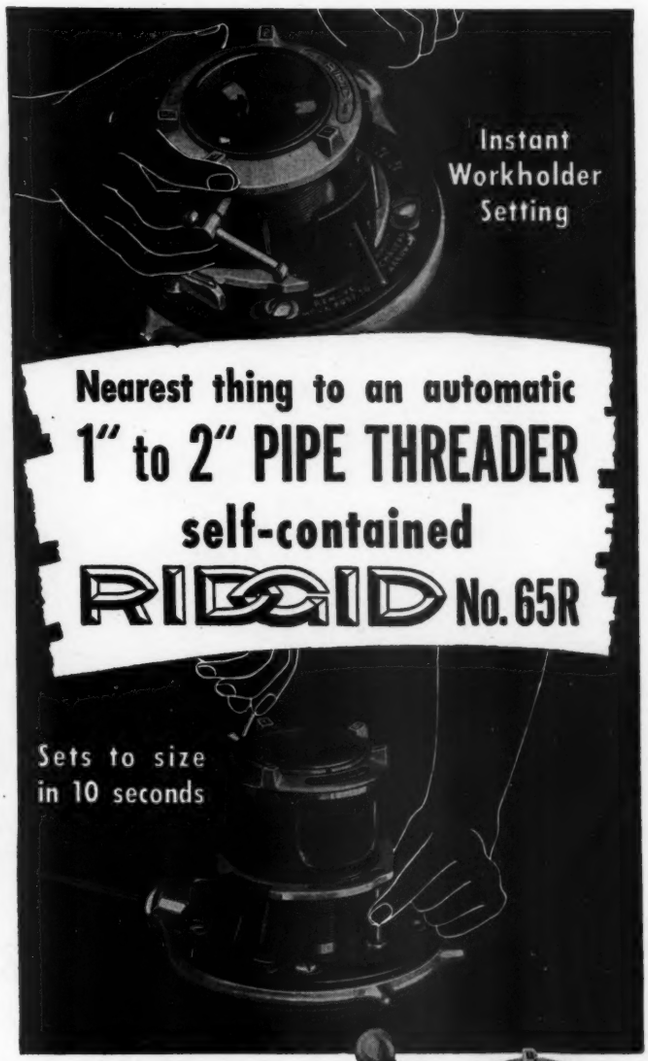
HEVI DUTY ELECTRIC COMPANY

HEAT TREATING FURNACES HEVI DUTY ELECTRIC EXCLUSIVELY
MILWAUKEE WISCONSIN

New Type RIDGID CUTTER with 4 cutting wheels

Cuts pipe if there's room for a quarter turn.

WHEN you have pipe to cut in close quarters, in a trench, near a wall or other pipes it's easier with this new RIDGID Heavy-Duty Cutter. The handle is short; and you use *four* heavy-duty cutting wheels *that roll right through pipe* up to 4" with a minimum of burr. The tough malleable frame holds perfect alignment, always cuts true. Comes in two sizes — No. 42, and No. 44. For tight-spot pipe cutting . . . ask your Supply House for the *new* RIDGIDs.



Nearest thing to an automatic 1" to 2" PIPE THREADER self-contained RIDGID No. 65R

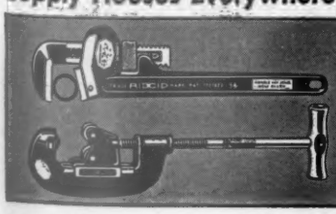
YOU set it to thread 1", 1¼", 1½" or 2" pipe by a simple 10 second adjustment. You set the mistake-proof workholder to pipe size by an instant turn of the gauge ring, tighten only one screw — no bushings needed. It's almost automatic. No extra chaser dies to carry around — one high-speed steel set stays in the die stock, cuts micrometer perfect threads on all four sizes of pipe with easy ratcheted strokes. Steel and malleable durability. For smooth speedy and easy threading . . . ask your Supply House for this self-contained RIDGID No. 65R.

Buy RIDGID Pipe Tools at Supply Houses Everywhere

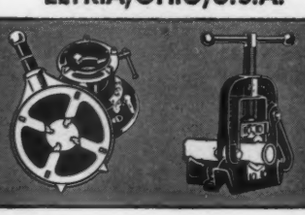
RIDGID

★ PIPE TOOLS ★

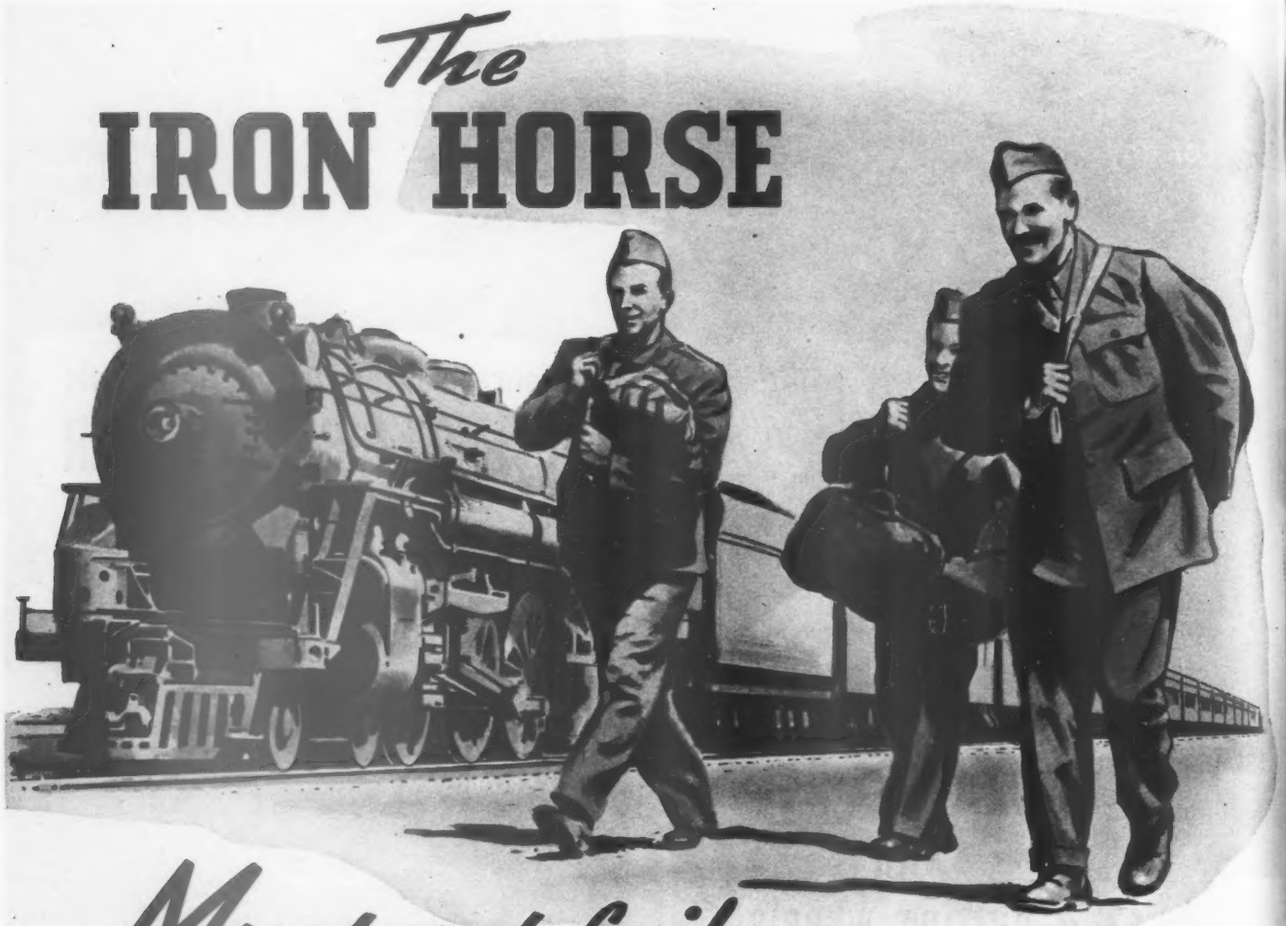
THE RIDGE TOOL COMPANY
ELYRIA, OHIO, U.S.A.



Fast-Working Tools for War . . . and the Busy Peace that's Coming



The IRON HORSE



Must not fail

The burden put upon railroads to transport troops and materials to strategic centers has taxed the endurance of motive power and rolling stock. Locomotives must be in service almost continuously. Time out for repairs must be held down. Babcock & Wilcox Boiler Tubes help keep locomotives on the road, reducing the time and labor costs of repair. B&W Tubes can be used for many mechanical repair jobs in the roundhouse machine shop. Many parts hitherto requiring intricate machining processing, can now be produced from tubing at considerable saving in time and money.

Seamless: B&W Seamless Tubing is made in a complete range of carbon and alloy steels in sizes from 1/2 to 8 5/8 in., O.D.

Welded: B&W Electric Resistance Welded Tubing is produced in carbon grades in sizes ranging from 3/4 in. to 4 in., O.D.

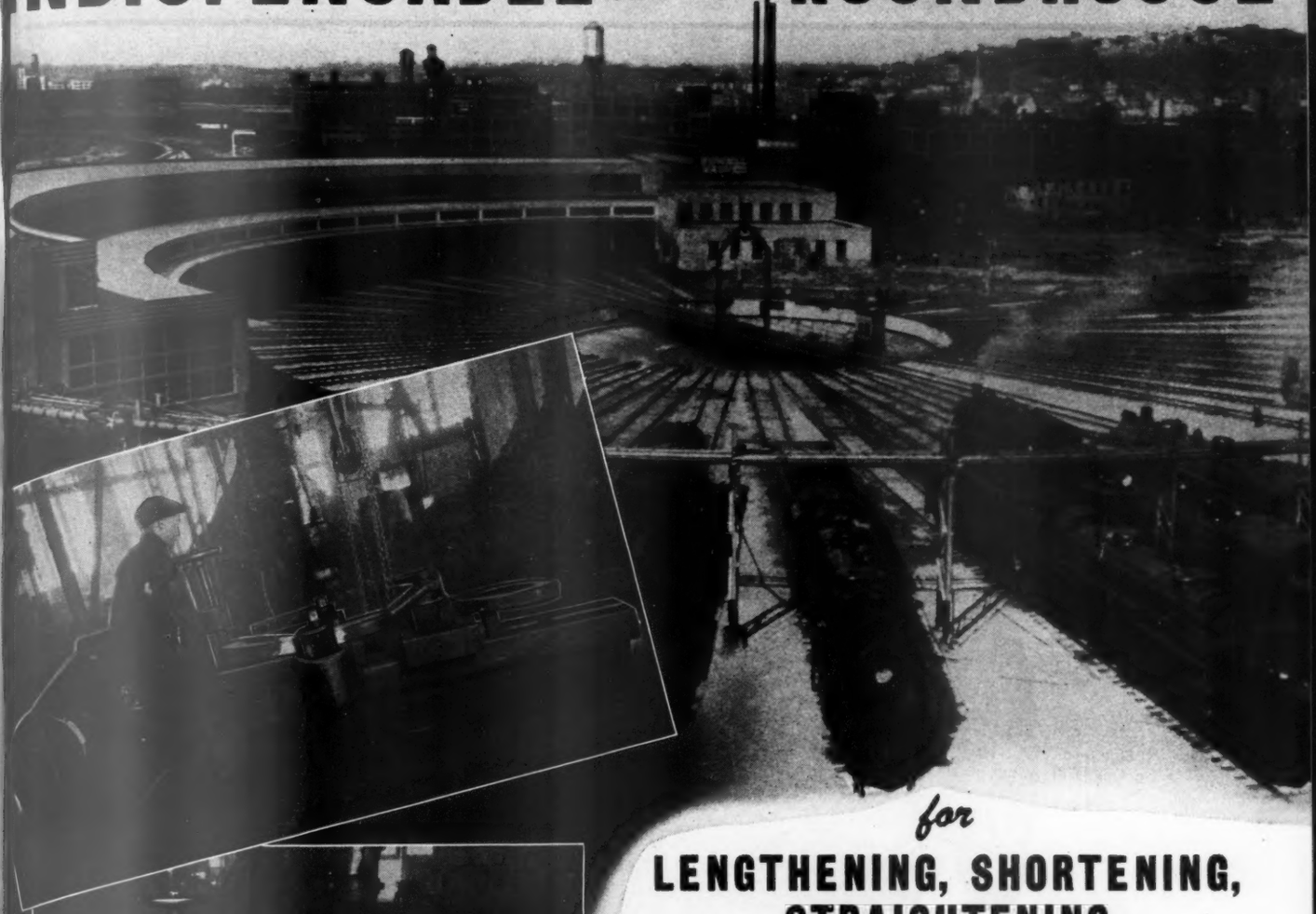
★ BUY MORE WAR BONDS! ★

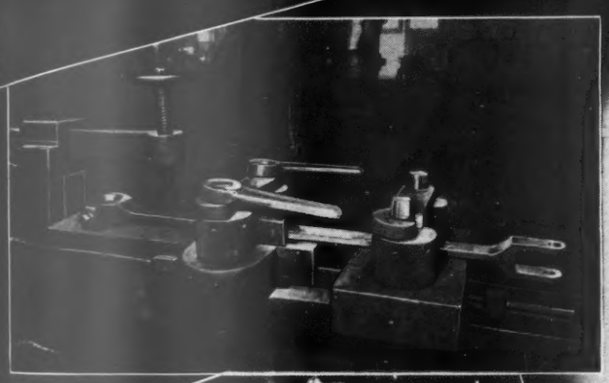
THE BABCOCK & WILCOX TUBE CO.

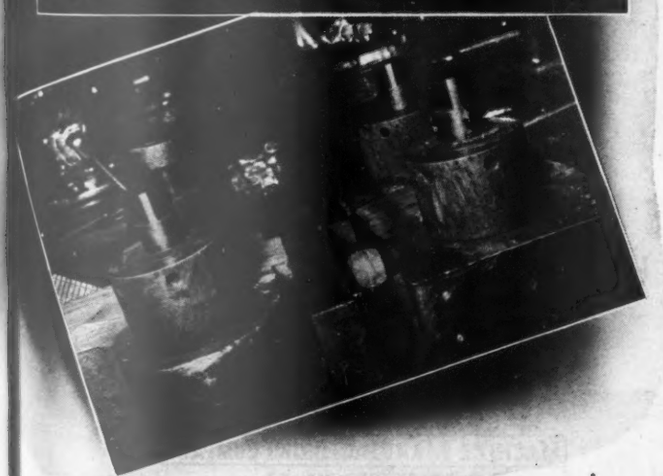
SEAMLESS TUBE DIVISION • *WELDED TUBE DIVISION*
BEAVER FALLS, PA. **ALLIANCE, OHIO**

TA-1273

INDISPENSABLE *in the* ROUNDHOUSE







The Walter Stock Adjusting Machine in operation: (A) lengthening an eccentric rod and (B) straightening a guide. Full details and specifications for this machine are included in Bulletin B-24. Send for a copy.

for

LENGTHENING, SHORTENING, STRAIGHTENING

LOCOMOTIVE PARTS

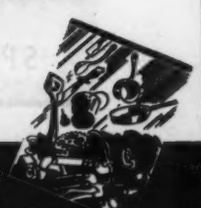
Railroads are taxed to capacity with war-emergency travel and freight movement, so the job of keeping rolling stock in shape has assumed gigantic proportions. The Walter Stock Adjusting Machine, manufactured by Watson-Stillman, can do many of the repair jobs formerly done manually—a long and not too accurate method.

In a shortening operation, one end of the piece is held by cams, the other end in contact with the ram, the heated portion in between. The pressure against the end upsets the heated area. In lengthening a piece, one end is held by cams in the frame, the other by the cams in the sliding block, with the heated portion in between. As the sliding block is pushed, the piece will be stretched and lengthened. For ordinary straightening jobs the work is placed crosswise the machine. As the ram moves forward the piece is pressed against the sliding block and straightened. All of these operations produce an accurately finished job, free from hammer marks, die marks or thin spots often left when such work is done under steam hammer.

Four types are available — Hydraulic Jack, Accumulator, Compressed Air and Motor-Driven Pump. The Watson-Stillman Co., Roselle, N. J.

WATSON-STILLMAN

Hydraulic Equipment, Valves, Forged Steel Fittings



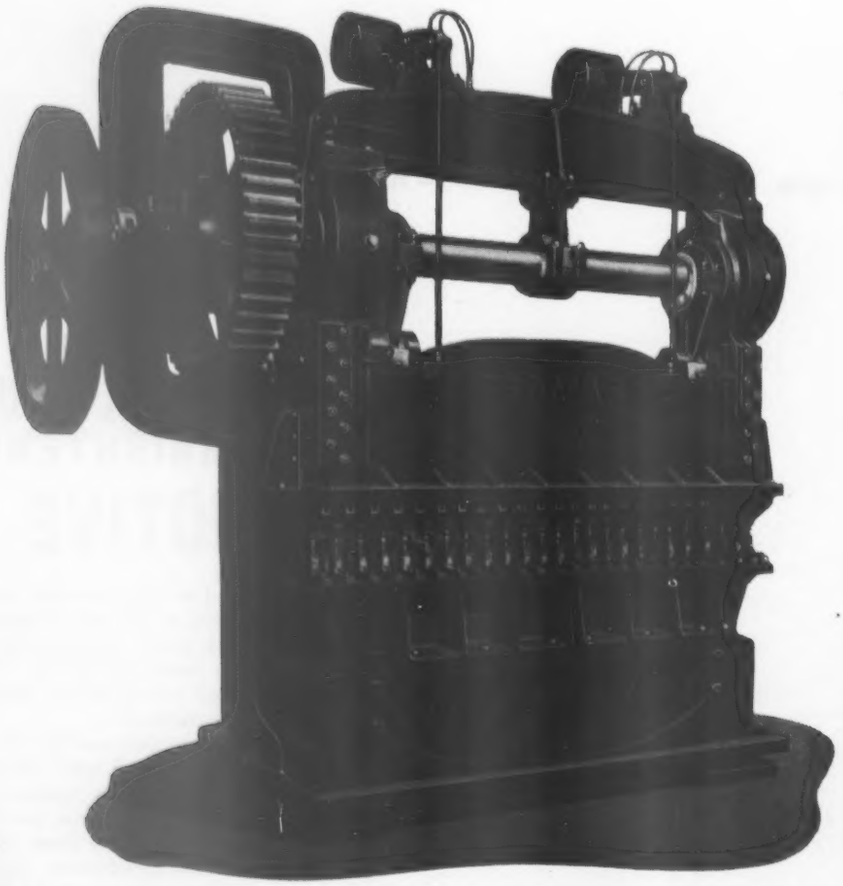
BUY BONDS FOR BIGGER BOMBS

For Victory ★★★ Let's all be Scrappers

THOMAS

Multiple Punches

For Railroad Car Shops



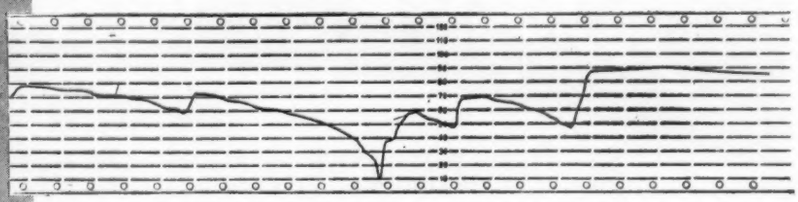
This 600 ton Multiple Punch was built by Thomas for one of our leading railroad systems.

Thomas can build equipment for the forge shop or car shop to meet your specific requirements.

THOMAS
MACHINE MANUFACTURING COMPANY
PITTSBURGH, PA.

SPACING TABLES • DUPLIKATORS • PUNCHES • SHEARS

RAILWAY SPEED RECORDERS



Provide a Running Record

— Running Speed and Distance Traveled
— Acceleration
— Deceleration
— Forward and Backward Movement
— Slippage

Two Models: CP High Speed Recorder, shows and records all speeds from 10 to 120 miles per hour.

CP Low Speed Recorder, identical in construction with High Speed model, but indicates and records speeds from 0 to 75 miles per hour.

Both models furnished in friction drive for steam locomotives or angle drive for Diesel locomotives.

Write for Bulletin 841 covering CP Railway Speed Recorders and CP Railway Speed Indicators.

For service where permanent record or performance charts are not required, there are two models of CP Railway Speed Indicators, identical in construction with CP Speed Recorder, but without recording chart.

★★★★★★★★★
PNEUMATIC TOOLS
ELECTRIC TOOLS
(Hicycle...Universal)
ROCK DRILLS

CHICAGO PNEUMATIC
TOOL COMPANY
General Offices: 8 East 44th Street, New York 17, N. Y.

★★★★★★★★★
AIR COMPRESSORS
VACUUM PUMPS
DIESEL ENGINES
AVIATION ACCESSORIES

Faster Get Wartime Speed on Resurfacing Jobs!

the NEW McQUADE CYLINDER HEAD SEAT GRINDER Does 6 Hours' Work in ONE

Locomotives were never worked harder than today. Never had it been more important to get them back quickly from the shop into active service. And the New McQuade Cylinder Head Seat Grinder is certainly doing its share in speeding resurfacing jobs.

One major road, operating 23 McQuade Grinders reports time savings of as high as 83%, owing to the Grinder's speed, ease of operation and precision accuracy which assures a steam-tight, trouble-free joint.

The Grinder works on an entirely modern principle . . . studs need not be removed . . . it is adjustable for varying cylinder diameters and for light or heavy cuts. Furnished with ½ HP. Universal Motor.

Furnished with ½ HP. Universal Motor

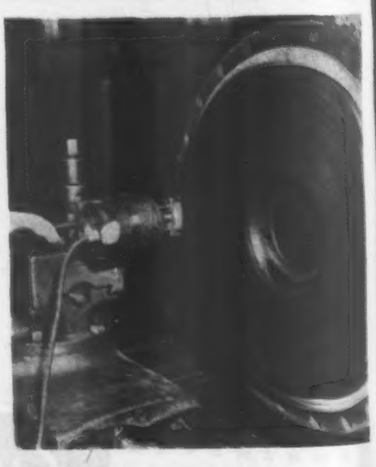
15 Minute—Hydraulic Valve and Cylinder BUSHING APPLICATOR

For Locomotive Valve and Cylinder Bushings

Portable, compact, lightweight, easily set up and operated by one man, it eliminates the need for compressed air, air motors and crane for handling power wrench. Can also be used for applying rod bushings, driving-box brasses and other similar operations.

Electric Tool Post Grinder

This companion tool to the Grinder is designed for speedy precision resurfacing of seats on Cylinder Heads. Serves as both lathe and boring mill and is furnished with cup-type grinding wheel. Independent cross-feed slide for adjusting grinding wheel to seat surface.



Ask Today For Full Particulars

R. J. McQUADE COMPANY
7734 South Phillips Ave., Chicago, Ill.

Reciprocating Hy-Draulic Machine Tools

To Help You Keep 'Em Rolling

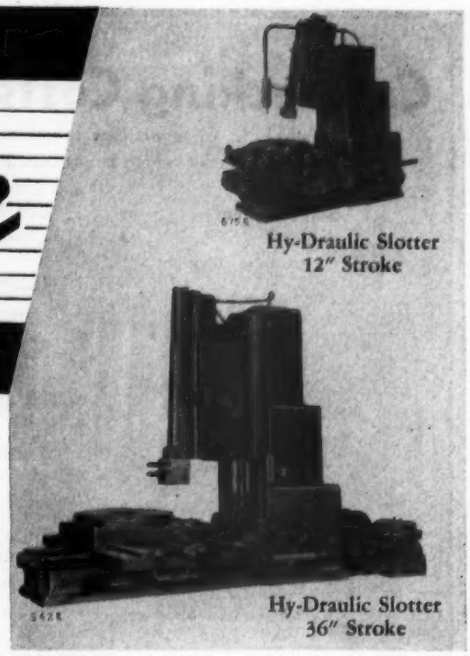
You can depend upon Hy-Draulic Shapers, Planers, Slotters and Shaper-Planers for important help in the war-winning job of keeping railway rolling-stock rolling. These machines . . . and these *only,* in their classifications . . . have hydraulic drives that provide unlimited numbers of cutting speeds and feeds, in specified ranges. Quickly, easily and without stopping the machines, operators can get the exact combination of cutting speed and feed for best results on work in process. They can reverse or "short-stroke" rams or tables at any point. Centralized controls and power rapid traverses promote easy set-up and high output.

Through years of serving railway shops, the manufacturers of Hy-Draulic Machine Tools developed standard chucks, heads and fixtures especially suitable for various operations in the manufacture and maintenance of locomotives and other equipment. Complete information about these, and suggestions for special handling of current work, will be supplied promptly on request.

Hy-Draulic Machine Tools are illustrated, described and specified in Catalog No. 1901. Write for your copy, *today.*

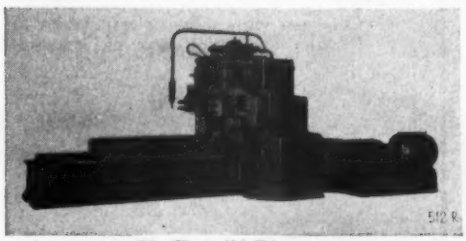
BUY UNITED STATES WAR BONDS AND STAMPS

4315

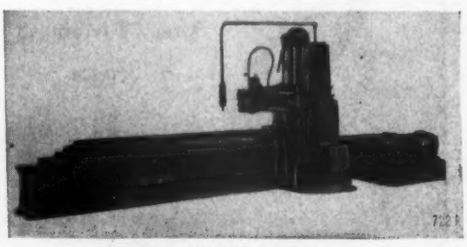


Hy-Draulic Slotter
12" Stroke

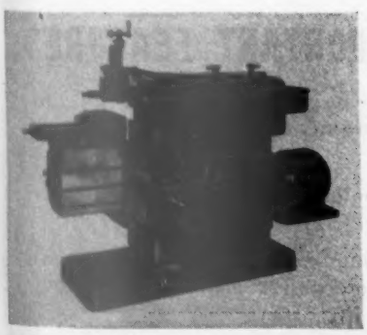
Hy-Draulic Slotter
36" Stroke



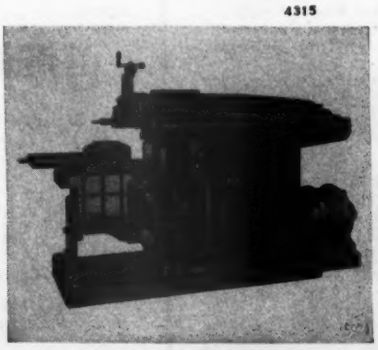
Hy-Draulic Planers
Double-Housing shown, Openside available



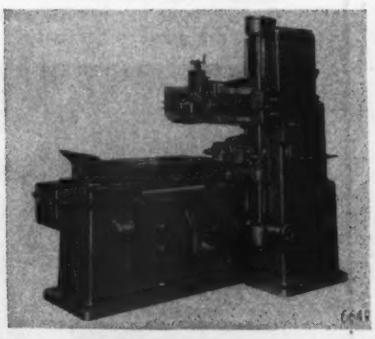
Hy-Draulic Shaper-Planers
66" to 144" stroke



Hy-Draulic Shaper
12" High Speed



Hy-Draulic Shapers
16" to 28" stroke



Hy-Draulic Shaper
36" Openside

Hy-Draulic
Reg U S Pat Off

Shapers . . Planers . . Slotters . . Shaper-Planers

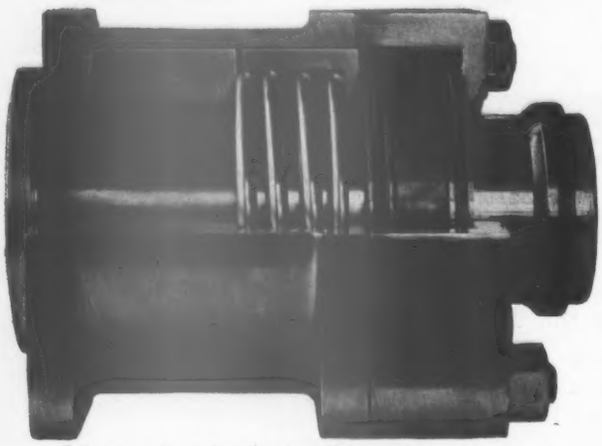
ROCKFORD MACHINE TOOL CO.

ROCKFORD, ILLINOIS, U.S.A.

Cut Packing Costs in Half

Meets I. C. C. regulations regarding freedom from steam-leaks, which might obscure engineman's vision.

Saves on Fuel — Less Rod Wear



Cut-away view showing installation of Ace Everseal Packing in stuffing box of locomotive piston rod

PACKING WEARS EVENLY

Uniform wear prevents scoring and making the rod egg-shaped. In no instance has wear by Ace Everseal Packing made rod grinding necessary.

Illustration showing how spring pressure causes Ace Everseal Packing to maintain steam-tight condition continuing to grip the piston rod tightly in spite of wear

The NEW ACE EVERSEAL MECHANICAL METALLIC PACKING

The NEW ACE EVERSEAL Mechanical Metallic PACKING is the result of more than fifty years of packing experience, research and exhaustive practical tests in regular locomotive service. Ace Everseal Packing is designed for either superheated or saturated-steam locomotives.

Combined Bronze and Cast Iron Construction Assures Unusual Wearing Quality

After seven years of intensive experimentation with either cast iron or bronze packing we discovered that a combination of the two in a six-segment packing assured service life double, or even treble that of either packing alone.

OTHER IMPORTANT FEATURES

- Designed to exert equal pressure on rod whether steam pressure is 10 lbs. or 500 lbs.
- Packing is interchangeable with all other packing.
- All six sections held in position and constant pressure on rod maintained by steel springs.
- Write for Full Particulars TODAY!

BADEKER MANUFACTURING COMPANY

Manufacturers of

ACE EVERSEAL METALLIC PACKING

408-416 So. Hayne Ave. — Chicago, Ill.

AJAX FORGING MACHINES AND FORGING PRESSES WITH DIRECT-ACTING AIR CLUTCH

Provide

- ★ **INSTANTANEOUS ACTION** due to quick clutching
- ★ **FASTER OPERATION** more machine strokes per minute
- ★ **LESS OPERATOR FATIGUE**
- ★ **LESS DOWN TIME** due to cushioned starting
- ★ **HIGHER PRODUCTION**
- ★ **LOWER PRODUCTION COSTS**

Ajax High Speed Forging Press Bulletin No. 75

Ajax Upsetting Forging Machine Bulletin No. 65-B

THE AJAX MANUFACTURING COMPANY

EUCLID BRANCH P. O. CLEVELAND, OHIO

621 MARQUETTE BUILDING • CHICAGO, ILLINOIS

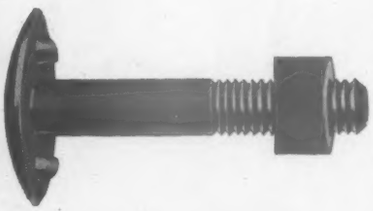
10 STAR ITEMS

from the Complete Line of

OLIVER

SPECIALIZED R R FASTENERS

WATERTIGHT BOLT
Weather-sealed, heavy flush head. No counter-boring needed. Corrugated neck prevents turning.



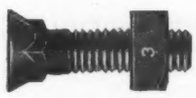
RUNNING BOARD BOLTS
Large, round head gives firm grip, long life. Made with lugs or fin under head.

COLLAR RIVET BOLT
For fastening wood and steel together. Collar fits inside wood, with head riveted over the steel.

FLUSH HEAD FREIGHT CAR BOLT
Widely used for flooring, etc. in freight cars. Fits flush without counter-boring.

CARRIAGE BOLTS
Accurately made, rolled and cut threads, all lengths and diameters. Special styles available.

PLOW BOLTS
Flat top countersunk head, square neck. A very useful car-builders bolt. All sizes.

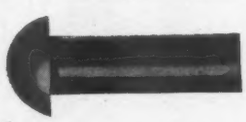


T-HEAD BOLTS
A machine bolt for use where head must be flush with surface of work.

COUNTERSUNK HEAD BOLTS
Another popular type for flush applications. Made in a complete range of sizes.

MACHINE BOLTS
All popular sizes and styles. Standard heads include: square, hexagon, button, etc.

RIVETS
All sizes, lengths and heads required for railroad use are included in the Oliver line.



OLIVER
IRON AND STEEL
Corporation

SOUTH TENTH AND MURIEL STREETS · PITTSBURGH, PENNSYLVANIA

AFTER 5 YEARS

Improves with age

THIS STATEMENT IS CONFIRMED BY

A.A.R.

MECHANICAL DIVISION

CIRCULAR DV-1048

The following information is taken from pages 27 and 38 of the circular mentioned.

Miner Class A-22-XB, Cylinder D-7935...These were in good shape externally, with the appearance of practically no wear on the housing or shoes.

COMPARISON OF TEST RESULTS WITH TEST RESULTS FOR NEW GEARS

Average Capacity of New Gears	Average Capacity of Gears after 5 Years' Service	Increase in Capacity of Service Gears over New Gears
20,100 Ft. Lbs.	22,900 Ft. Lbs.	Plus 13.93%

W.H. MINER INC.
CHICAGO

Use our Unit Exchange Plan to sp

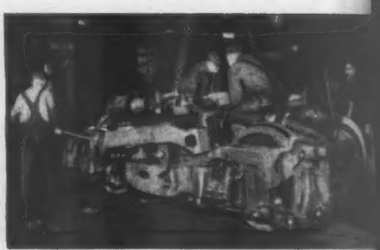
What the Plan is:

Our Unit Exchange plan for Alco-G.E. locomotives is a service which makes constantly available to you a pool of interchangeable equipment units, such as motors, generators, and superchargers. Rather than repair a worn unit, you can quickly exchange it for one from the pool, so that your locomotive can continue on its way while the worn unit is being repaired in the nearest Alco-G.E. service shop. Sixteen conveniently located warehouses stock these units and we can draw on any one or all for the parts you need in a hurry. The number and types of units stocked in each warehouse are determined by the number of locomotives operating in the adjacent area.

How the Plan Operates:

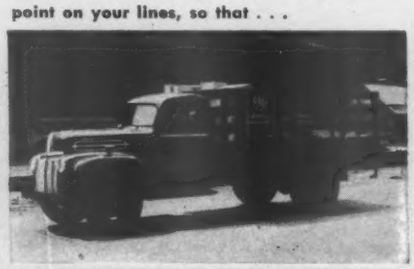
1. When you need a locomotive motor, for example, telephone our nearest service shop, warehouse, or office.

2. Prompt delivery will be made from the nearest warehouse to any designated point on your lines, so that . . .



3. . . . you can remove the worn motor and install the new one at the same time. In this way . . .

4. . . . your locomotive goes back to work quickly, releasing shop space, man power, and equipment for other maintenance operations. And . . .



5. . . . in the meantime, the replaced motor is speeding back to the nearest Alco-G.E. factory or service shop . . .

6. . . . where we have complete facilities to do a thorough reconditioning job. When reconditioned, the motor is placed in the Unit Exchange stock, ready for the next call.

Alco GE

The best investment in the world is in this country's future—BUY WAR BONDS

113-4-9600

AMERICAN LOCOMOTIVE AND GENERAL ELECTRIC

to speed maintenance, boost ton-mileage, and save time and materials

HERE'S HOW . . .

REDUCES OUT-OF-SERVICE TIME For periodic overhauls you can schedule an exchange unit to arrive when it's needed. Then remove the worn unit and install the new one in one operation and put the locomotive back into service.

RELEASES YOUR MAN POWER Your men can proceed with other jobs while our men do the repair work they are specially trained to do.

ELIMINATES WAITING There is no delay while worn parts are being shipped to and from remote repair points, or while lengthy repairs are being made.

CONSERVES VITAL MATERIALS You avoid duplication in your stock of items carried in our warehouses, making more material available for war.

MAKES UNITS IMMEDIATELY AVAILABLE No "red tape." Replacement units are in our warehouses—ready for immediate delivery and installation.

. . . and OTHER ADVANTAGES

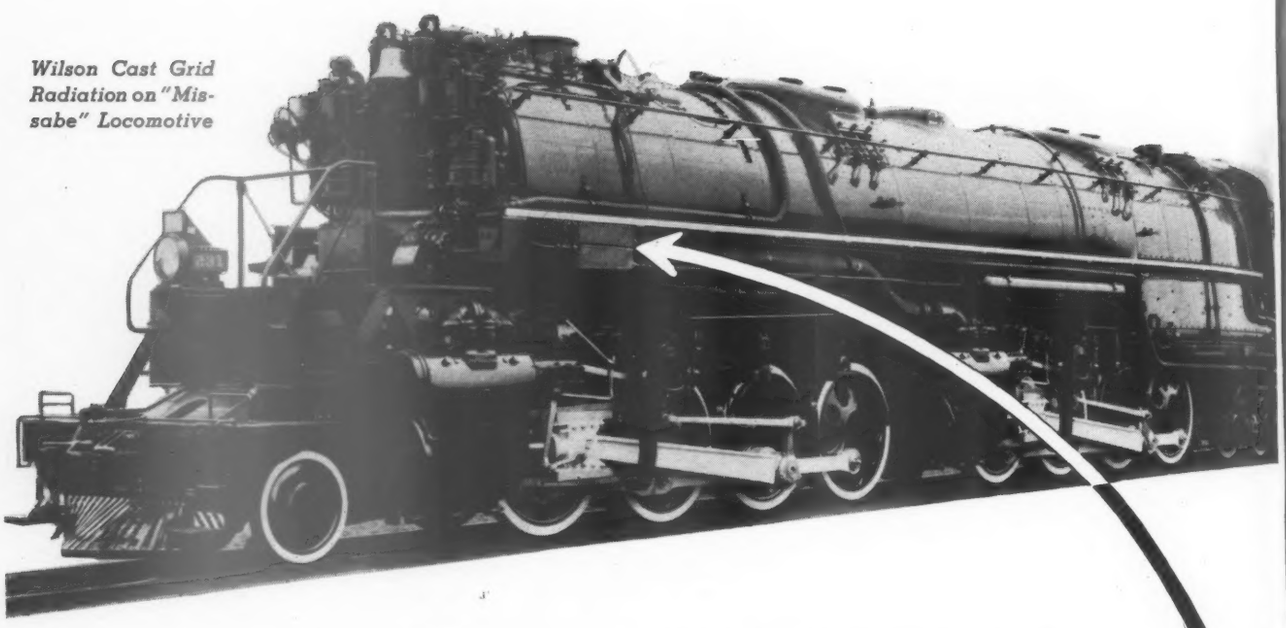
FREES SHOP SPACE Use your shops only for work which cannot readily be sent out.

RELEASES SHOP EQUIPMENT Ease the pressure on your equipment by using our facilities—they are specially designed to service Alco-G.E. units.

REDUCES PARTS INVENTORY We maintain a pooled stock of units in 16 warehouses and can assure you quick delivery.

INSURES BETTER REPAIRS Our men are specially trained to service diesel-electrics.

AVAILABLE SOON—a detailed description of the plan, with listings of the units available, the 24-hour service shops, and the warehouses where Unit Exchange items are stocked. Write now to General Electric Company, Sec. 113-54, Schenectady, N. Y. for GEA-4158. We'll send your copy as soon as it comes off the press.



Wilson Cast Grid Radiation on "Missabe" Locomotive

Wilson Variable Radiation effects complete primary cooling

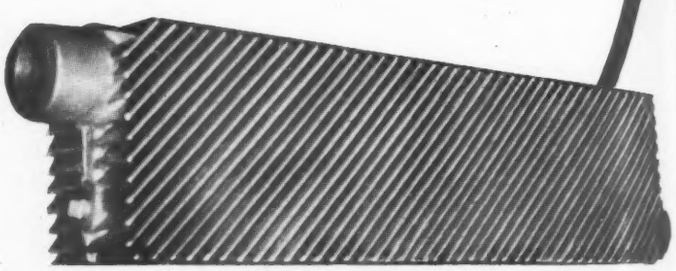
Trouble-producing moisture in locomotive compressed air must be precipitated . . . this is generally understood.

If *primary* cooling is complete and efficient *before* the air enters No. 1 main reservoir, all the moisture will be precipitated in the reservoir where it can be quickly removed.

And . . . the capacity of the reservoir is thus greatly increased. Due to the difference in density between hot and cold air, this increased reservoir capacity may be considerable.

Wilson Radiation presents an efficient and compact all-cast-iron grid element for either primary or after cooling. Its construction eliminates the use of such war-critical materials as steel or copper pipe.

And, Wilson Grid Radiation costs less . . . has the durability of cast iron . . . is tested to 500 pounds per square inch before shipment.



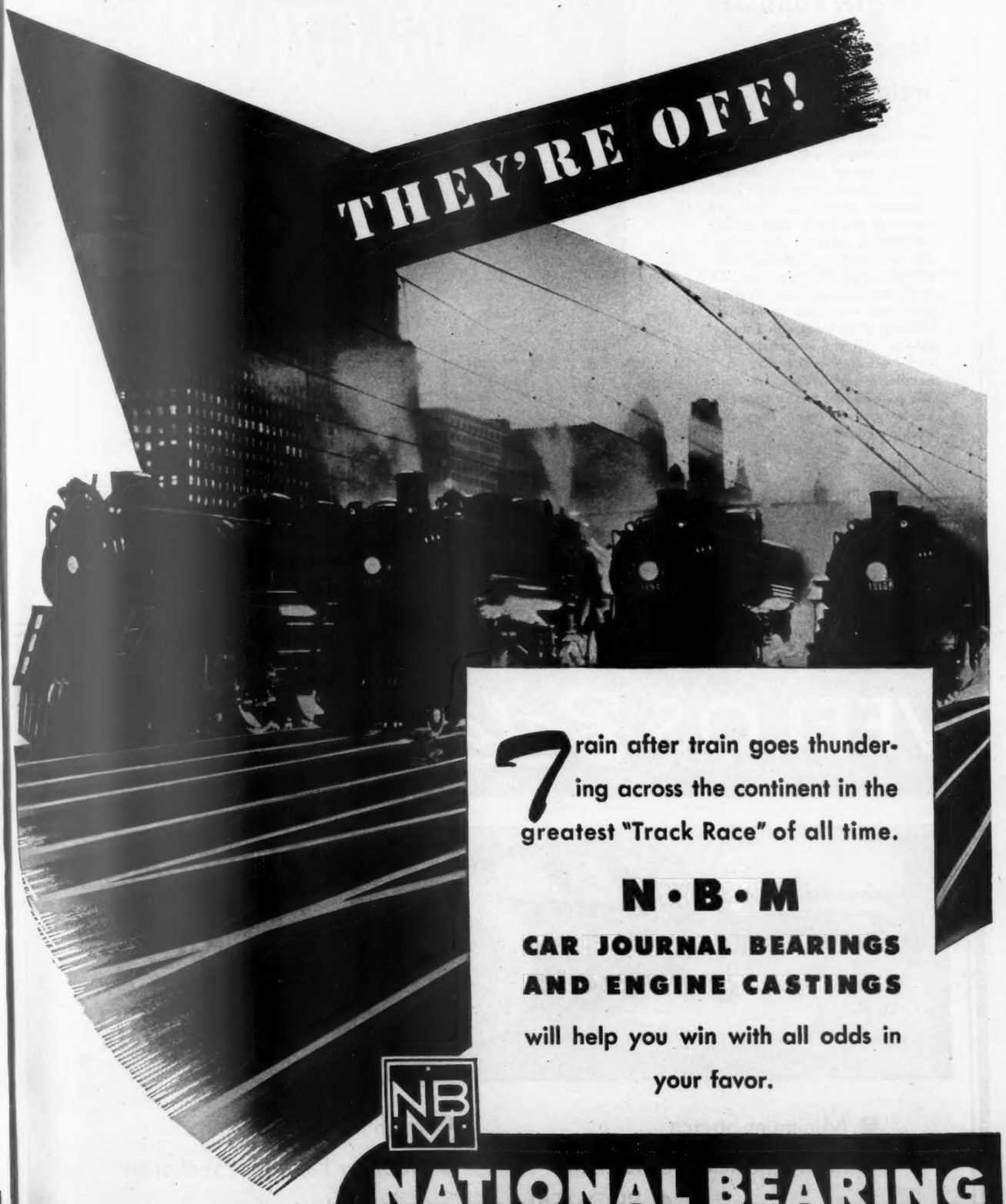
Wilson All-cast-iron Grid Elements

WILSON PRODUCTS

Unit Heaters · Blow-off Cocks
Mufflers or Separators
Feed Water Heaters

WILSON ENGINEERING CORP.

122 S. MICHIGAN AVENUE, CHICAGO, ILL.



Train after train goes thundering across the continent in the greatest "Track Race" of all time.

N • B • M

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Write for Bulletin WP 22

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Above: Model No. 12. 1,200 lb. capacity manually operated

Left: Model No. 300. 30,000 lb. capacity, push button control with variable speed rotation for automatic welding.

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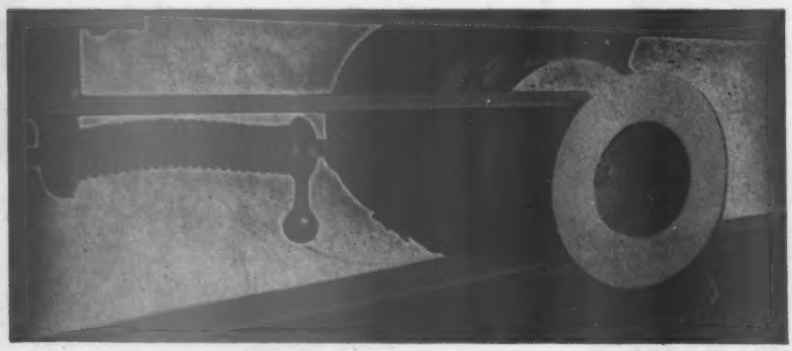

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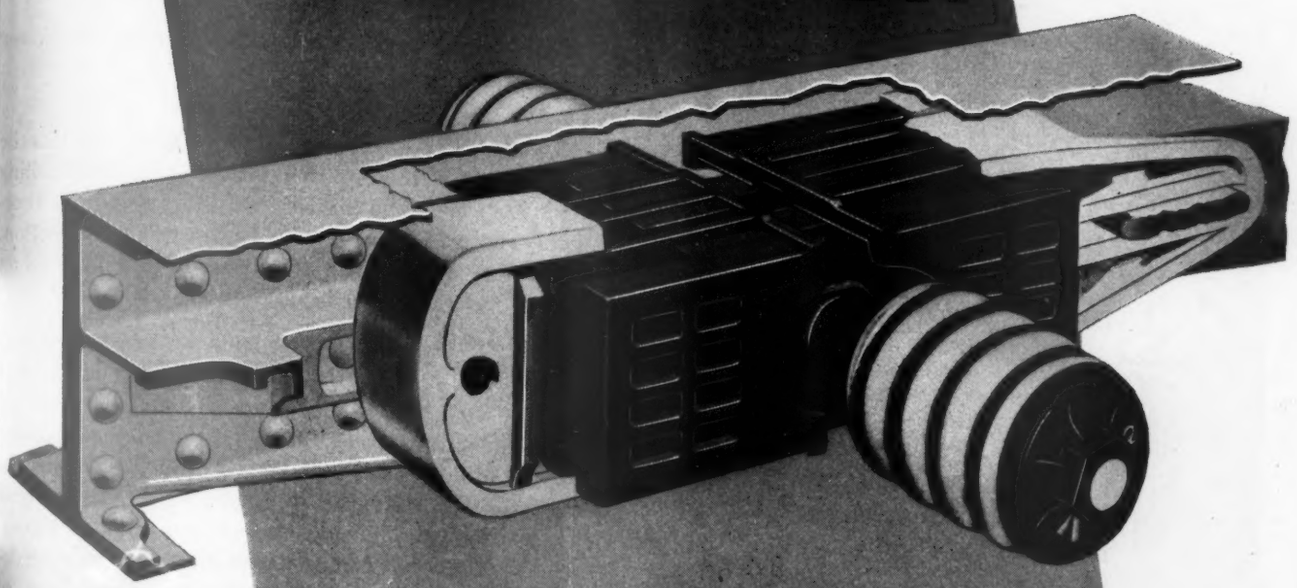

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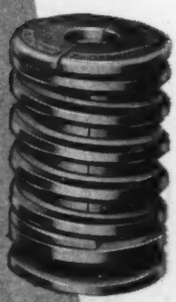

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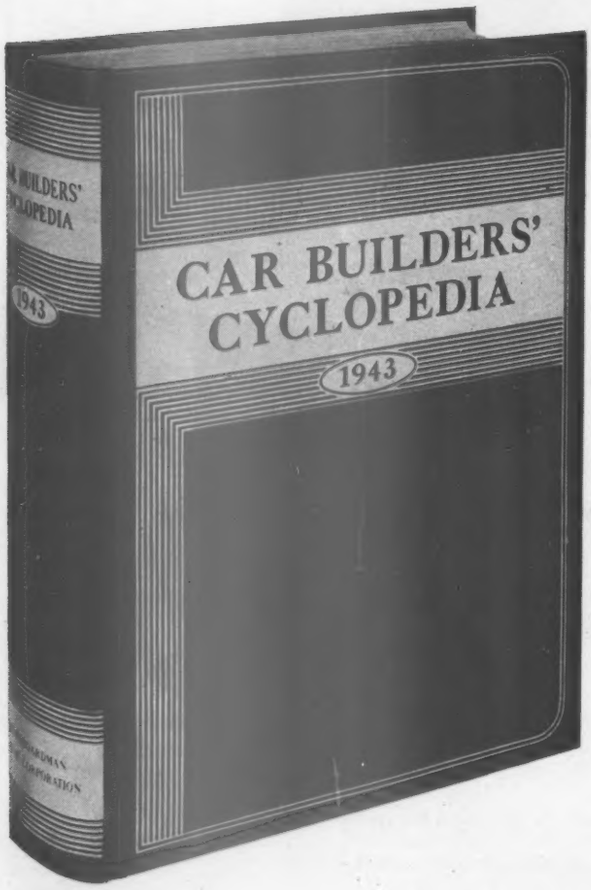

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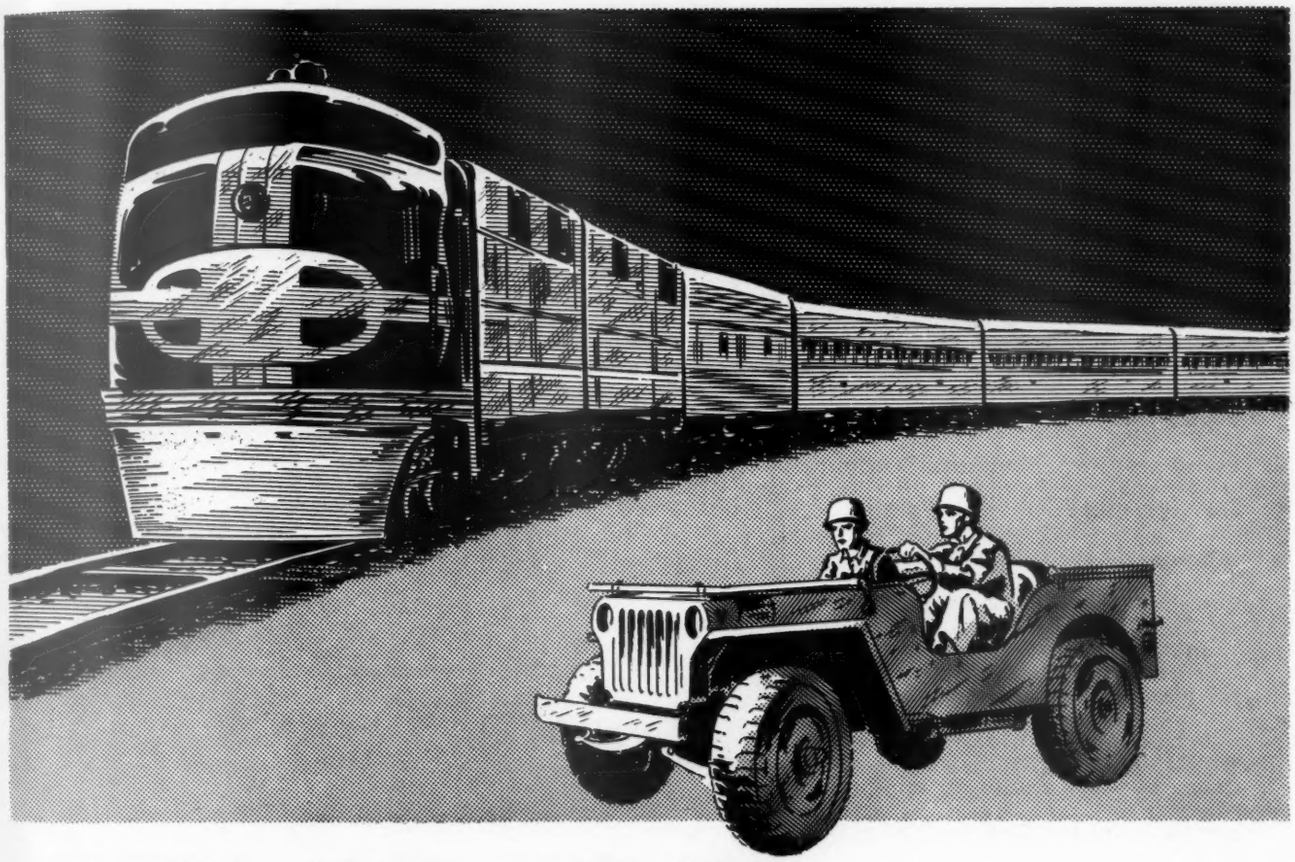

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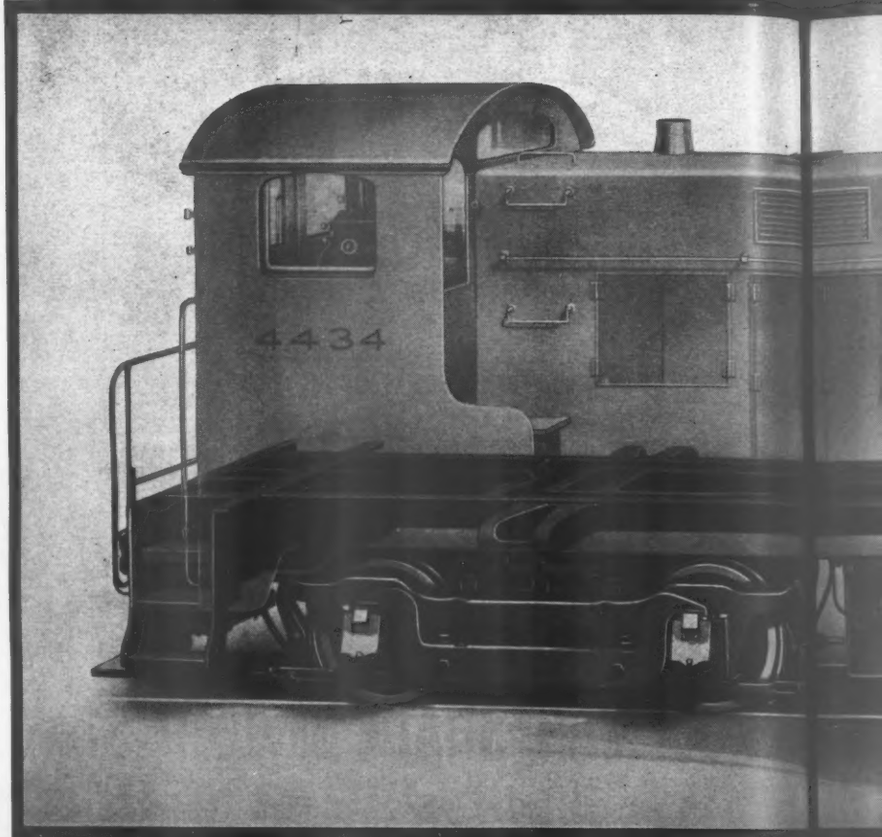

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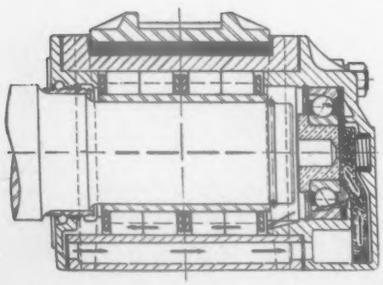

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State of New York } ss.
County of New York }

Before me, a Notary Public in and for the State and county aforesaid, personally appeared Roy V. Wright, who, having been duly sworn according to law, deposes and says that he is the Editor of the *Railway Mechanical Engineer* and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations, printed on the reverse of this form, to wit:

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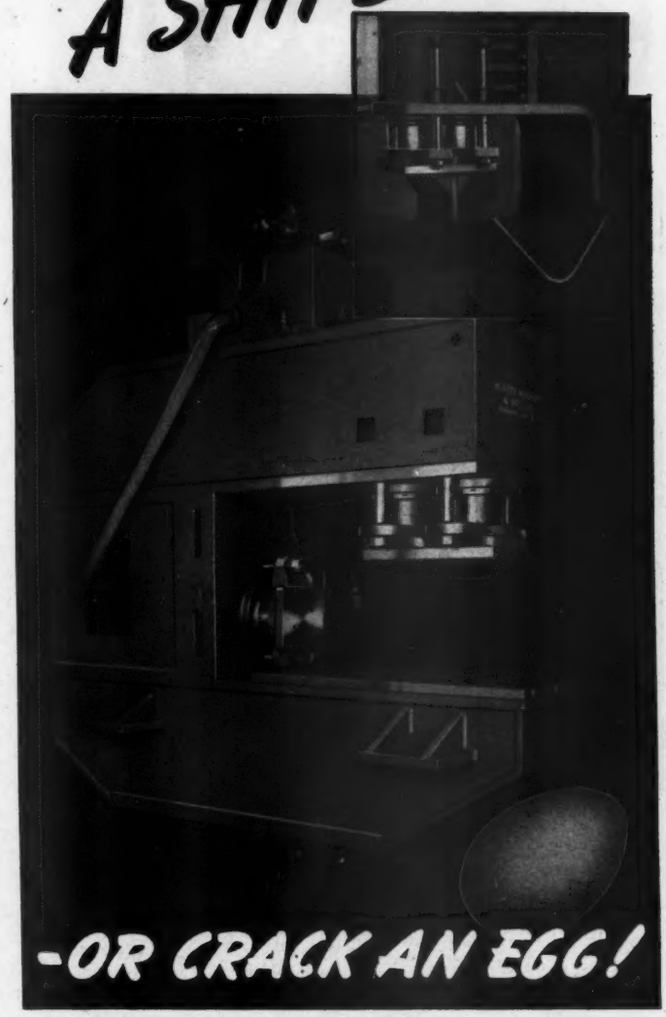

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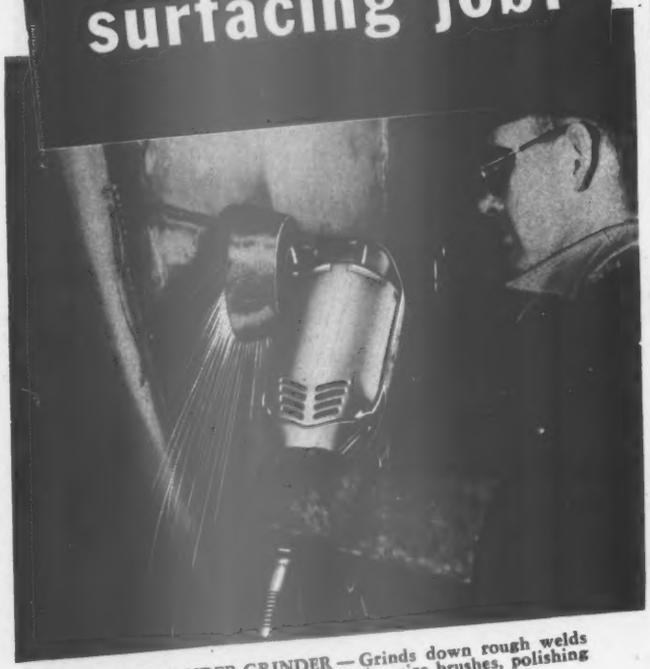

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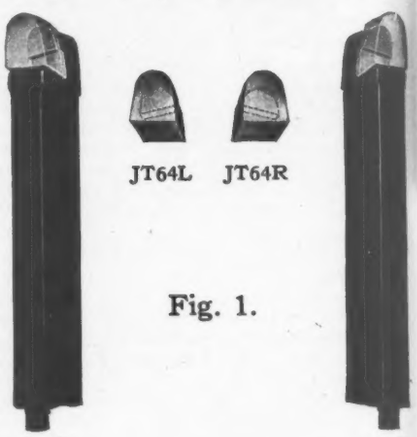
O K Single-Point Cutting Tool Bits are fabricated from high speed steel. The holders are made of chrome, nickel steel, forged and heat treated for maximum strength.



JT64L JT64R

031JL 031JR

Fig. 1.

Fig. 1—Tools and holders specially designed for rough turning wrought steel in double-carriage, wheel-turning lathes.

These tools and holders have double-taper mating surfaces designed so the thrust of the cut forces the tool into the holder. A mechanical clamp eliminates further possibility of the tool's loosening while cutting. This locking feature, enhanced by the fact that these tools are drop forged and heat treated to withstand severest service, has during many years' actual use in railroad shops, proved this inserted-blade design to be far superior to the solid tools and welded-tip tools formerly used.

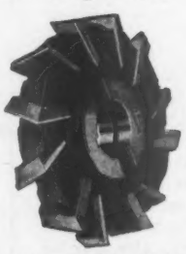


Fig. 2—No. 610

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O K Multiple-Point Cutting Tools are fabricated from the same variety of metals as are the O K Single-Point Tools. The blades are so designed that when driven into mating slots in the body they lock automatically and positively without the use of wedges, pins or other mechanical locks.

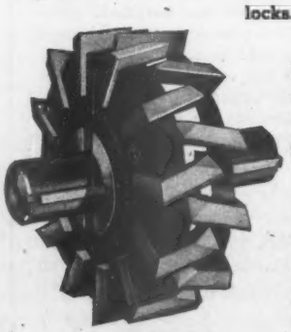

Fig. 3—No. 600

Fig. 2—O K Alternate-Angle Slotting Cutter for milling slots up to a limited width. Blades are adjustable for maintenance of width.

Fig. 3—O K Interlocking Slotting Cutter for milling slots beyond the capacity of the Alternate-Angle Cutters. This cutter is also adjustable for maintenance of width.

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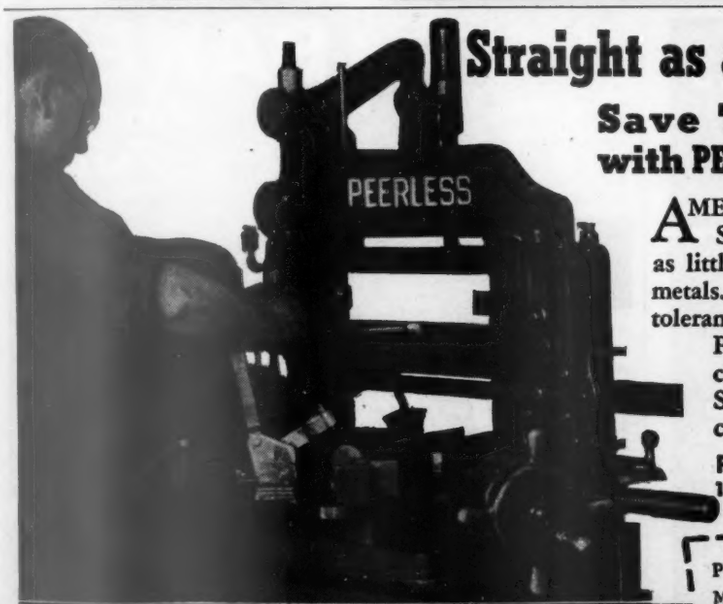

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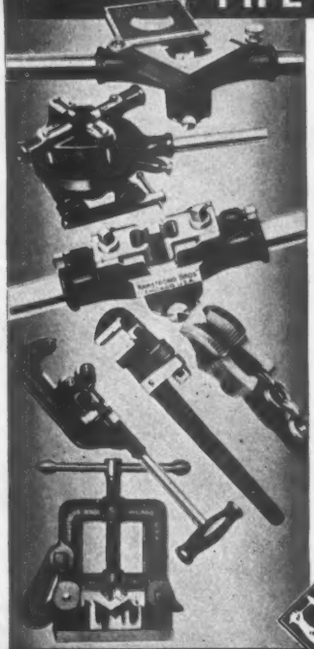

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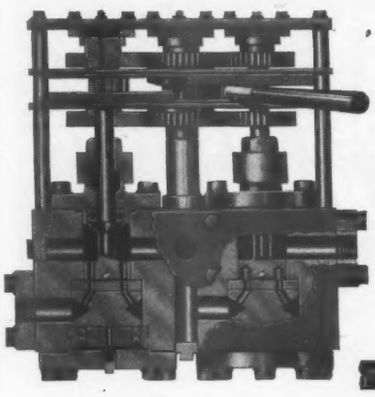
DANVILLE, ILLINOIS

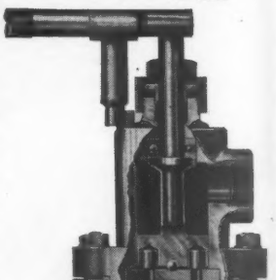
No Shock on Line When Closing



HYDRA VENTURI-VACUUM VALVES

3 and 4 way straight operating or neutral point operating valve

2 way angle and straight through shut-off valve



A turn of the wrist operates the Hydra Venturi-Vacuum Valve and no matter how high the pressure there is no shock on the line when closing. Other important features,—no springs or cups to bother with, reduced maintenance cost, long life. Many installations in the Steel, Rubber, Packing, Car Building, and Foundry Industries support these claims.

Write for descriptive folder.

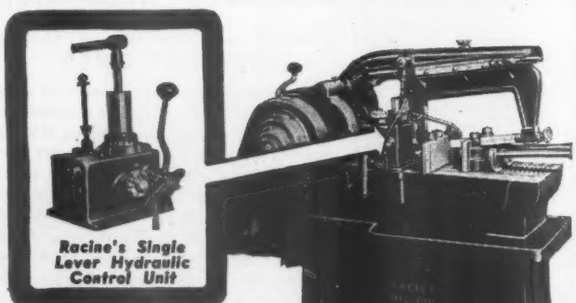
ALBRIGHT EQUIPMENT CO.
FERNDALE, JOHNSTOWN, PA.

Ease of handling; unobstructed vision; self-stabilizing feature for handling loads at sides; always-in-gear design; and automatic braking in all crane operations . . . these and other advanced engineering features provide the SAFETY required to meet the exacting demands of the War effort. 2½, 5, and 10 ton capacities. Agents in all of the principal cities.

USERS: Union Pacific; Missouri Pacific; B & O; Chesapeake & Ohio; Pennsylvania; Canadian Pacific; Illinois Central; Southern Pacific; etc.

Kranekar FOR RAILROADS

SILENT HOIST WINCH & CRANE CO., 845 63RD ST., BROOKLYN, N.Y.



High Speed — Oil Cushioned

RACINE metal cutting saws

PRECISION CONTROL OF FEED AND PRESSURE

The Production Saws of Modern Industry

Efficient, accurate control is essential in War Production today. Racine provides this precision with the above compact control unit. A flexible feeding action that automatically regulates itself to the kind, size and shape of work, speeds production and saves blades. Capacity 6"x6".

Other Features of Racine "Oil-Cut" Saws

Three-speed transmission for high speed production — Adjustable Saw Guide — Saw frame eliminates blade distortion. Other model Racine Saws in capacities ranging from 6"x6" to 20"x20".

Complete information and prices furnished on request. Address Dept. RE-S.

Investigate Racine's Oil Hydraulic Pumps & Valves

Pumps—Cap. 0 to 30 G. P. M. Pressures up to 1000 lbs. Four-Way and other Oil Hydraulic Valves—⅜" to 1½" pipe sizes.

RACINE TOOL and MACHINE COMPANY
Standard for Quality and Precision
RACINE, WISCONSIN • U. S. A.

AIRETOOL
BLOW DOWN LINE CLEANER

CLEANS F-A-S-T-E-R • MORE ECONOMICALLY

Airetool's Blow Down Line Cleaner will remove scale and foreign deposits in tubes faster because of Airetool's unique power seal motor that gives extra power and because of Airetool's accurately heat treated alloy steel non-tracking cutters. And, it does the job more economically. The savings in time—as much as one-half—and the fact that Airetool cutter replacements are needed less often is the reason. In an actual test Airetool Cleaners need cutter replacements *only 24% as often* as a competitive cleaner.

In addition Airetool manufactures an equally efficient cleaner for every type of locomotive pipe cleaning job—for Arch Tubes, Branch Lines, Nicholson Syphons, and the new type Circulating Tubes. Learn all about these labor, time and money saving Airetool Cleaners and how they can help you.

Write For BULLETIN R-17 Today.

AIRETOOL MANUFACTURING COMPANY

Greater SAFETY For a Lower Cost

WHY take chances with ordinary cotters—especially since the speeds of all trains have been increased?

Every application on a car, locomotive or any other moving vehicle can be made in absolute safety with the COOKE Pin and Cotter.

A couple of taps with a hammer drives the COOKE Cotter into place. It is securely locked in one operation—and it will stay there until removed. It is easily and quickly applied. You save time, money and promote maximum safety.

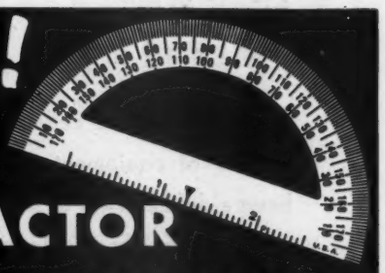
Note: This wedge opens, spreads and locks the cotter, thereby eliminating vibration and wear.

COOKE PIN and COTTER

"SELF OPENING—SELF LOCKING"

American Railway Products Co.
162 Post Road, Darien, Conn.

FREE!
A USEFUL PROTRACTOR AND A REPAIR HAND BOOK



The 40-page Smooth-On Handbook contains 170 diagrams and easy-to-follow instructions for making economical and lasting repairs to railroad equipment, pipe lines, machinery and fixtures of all kinds.

USE SMOOTH-ON . . . a dependable iron cement that, since 1895, has been used by engineers and mechanics for making lasting repairs. Buy from your supply house or if necessary, direct from us, in 7-oz., 1-lb. and larger containers.

MAIL IT TODAY The SUPPLY IS LIMITED!

Smooth-On Manufacturing Co., Dept. 32
570 Communipaw Avenue
Jersey City 4, New Jersey

Please send the FREE protractor and Smooth-On Handbook.

Name.....

Address.....

11-43.....

Do it with SMOOTH-ON

THE EDITOR'S DESK

THE PEAK PASSED, BUT NO LET-DOWN IN SIGHT

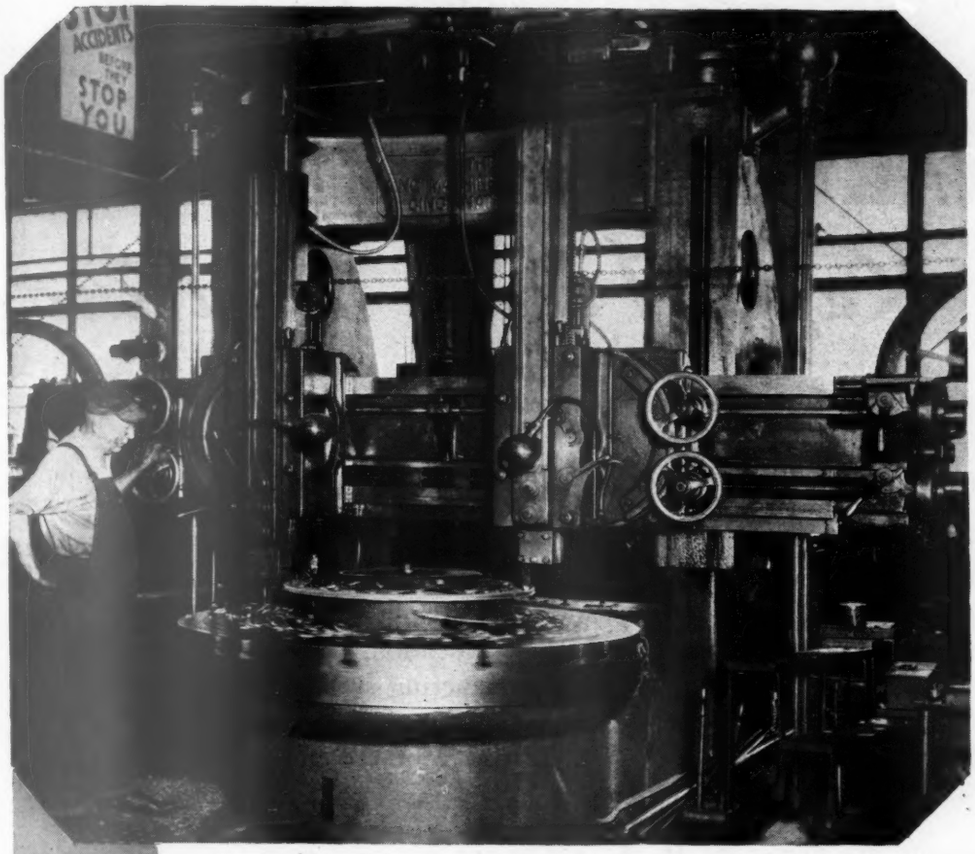
The railroads are to be congratulated upon the remarkable record they have made in 1943. The October peak has been passed safely, but they will be faced with heavy traffic during severe winter weather, with no possibility of a let-up after it is over, unless, perchance, the Nazis should crack and one phase of the World War should come to an end.

The railroads have certainly had no break as to priority of equipment or manpower and it has been a difficult fight to secure enough material to maintain the cars and locomotives. Mechanical department officers have been at their wits end to keep the equipment in such shape that it could continue to function under heavy duty. It is to be hoped that the War Production Board will find it possible to loosen up and permit the railroads to add to their cars and locomotives. The railroads mean so much to the successful carrying on of the war that they must not be permitted to deteriorate to a point where they cannot meet the demands that will be made upon them. In other words, it is just as essential that they be furnished with the necessary supplies and equipment as it is to protect the branches of the armed services.

Readers of the *Railway Mechanical Engineer* and those who review the reports of the mechanical associations in this number, must have a keen realization of the extent to which the mechanical department forces have used their wits and energies and have made the best possible use of those materials and such manpower as was available.

Fortunately the splendid showing that the railroads have made under severe handicaps is being appreciated by the public in general, and the Army and Navy officers in particular. This encouragement is heartening and is an inspiration to keep up the fight and put forth even greater efforts.

Roy V. Wright



King 72" Boring Mill

WORKS FOR THE RAILROADS AND THE GOVERNMENT

KING BORING MILLS are doing their bit on every industrial front—and a good percentage of the installations are working 24 hours a day.

The demand upon the versatility of King Boring Mills is exemplified by the above 72" unit installed in a large western locomotive repair shop.

The job on the machine is a 39" dia. smoke box door — simple — nothing to it but, the job which preceded it, was a large cylinder liner for a vessel on the Pacific Coast.

The regular railroad jobs handled on this King Mill include cylinder bushings, wheel centers, tires and all sorts of heavy boring and turning jobs — handles all of them and works overtime for the government.

The KING MACHINE TOOL Company

BUILDERS OF VERTICAL BORING AND TURNING MACHINES EXCLUSIVELY

CINCINNATI, OHIO

"Four Way"

BRAKE MAINTENANCE

Helps Keep Trains Rolling

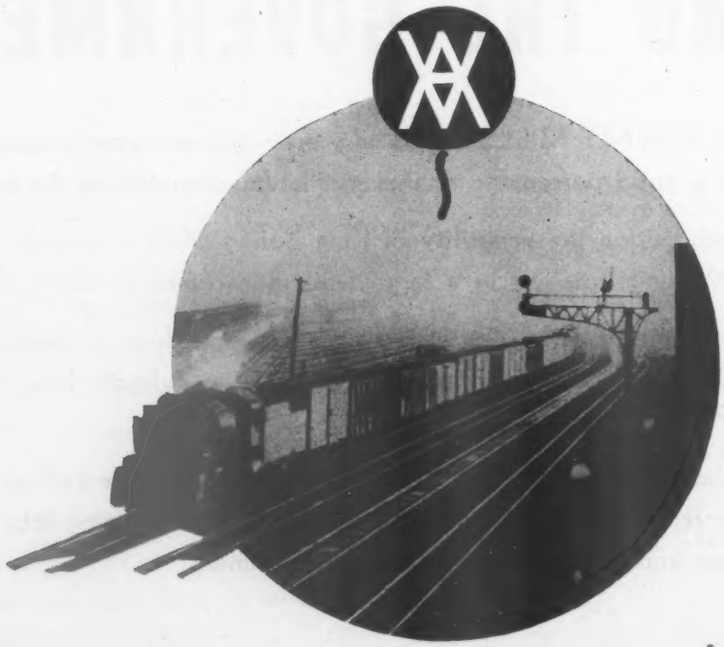
Since the function of Air Brakes in safeguarding and expediting vital freight is even more important today than ever before, we offer the following suggestions as effective means to keep them in good condition.

1 An out-of-order valve should not be taken apart while it is on a locomotive or car. Remove the complete device, or portion, and replace with one known to be in good condition, keeping exposed internal surfaces protected from dirt and injury. All inspection, cleaning and oiling should be done at a shop bench.

2 If minor replacements are necessary, it is sound practice to use "genuine" parts, to insure a good maintenance job without extra machining or fitting. Time and labor are minimized, reliable service prolonged.

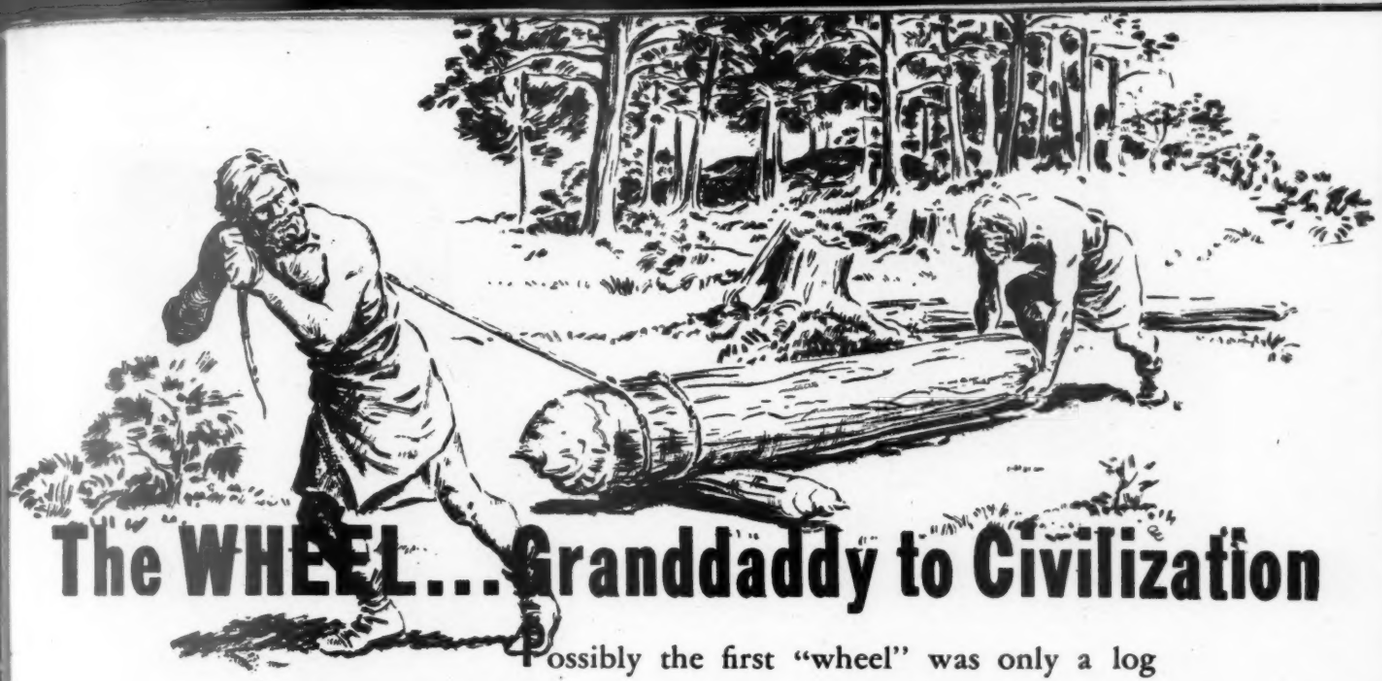
3 When a valve needs major repairs, let us do this work for you. We have adequate and proper facilities—skilled mechanics, improved methods, accurate machines and tools. Exacting standards in materials and workmanship are thus maintained, correct performance of reconditioned apparatus is guaranteed.

4 Consult our field men freely concerning your problems of air brake operation and maintenance. They are eager to help you get the best service from your existing equipment on hard-working cars and locomotives.



WESTINGHOUSE AIR BRAKE CO.

WILMERDING, PENNSYLVANIA



The WHEEL... Granddaddy to Civilization

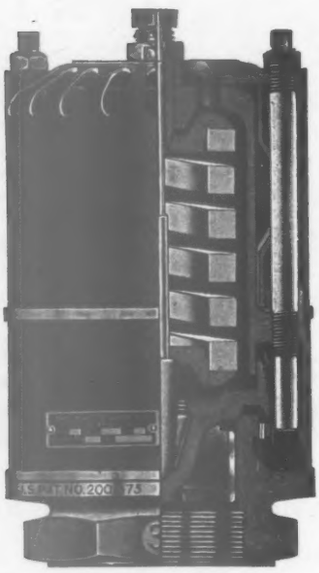
Possibly the first "wheel" was only a log which some pre-historic man accidently set to rolling, which in turn set the man to thinking. But, whatever its origin, it surely started man on his way, made possible much of the progress he has since enjoyed.

Here at Union Steel our preoccupation with the wheel has produced the unique Web-Spoke Driving Wheel Center. With it the modern locomotive is better able to meet today's demand for faster, heavier railroad traffic.

UNION STEEL CASTINGS

DIVISION OF BLAW-

BACK THE ATTACK — BUY U. S. WAR BONDS

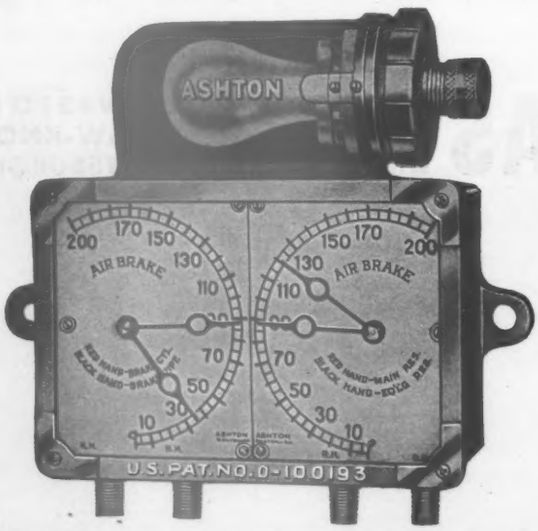


ASHTON FC-10 MUFFLED SAFETY VALVE

The FC-10 Muffled Locomotive Safety Valve was developed to meet the condition of increased evaporating efficiency on high pressure locomotive boilers. It has operated successfully for a period of over ten years in road tests and regular service on locomotives carrying pressures up to 300 pounds per square inch. Throughout this period it has operated without the necessity of the removal of any parts.

ASHTON NO. 52 DI-3 6¼" DOUBLE DIAL LOCOMOTIVE STEAM GAGE, LAMP HOUSING CAST INTEGRAL WITH CASE

The New Style No. 52 DI-3 Locomotive Steam Gage eliminates the need of separate boiler pressure gages for engineer and fireman. Each face of the Gage has a dial and hand illuminated by a standard electric lamp bulb and can be seen from either right or left side of the locomotive. Dial has a permanent white porcelain surface which is positively non-glare and can readily be cleaned.



ASHTON NO. 62 QI-7 QUADRUPLEX ILLUMINATED LOCOMOTIVE AIR BRAKE GAGE. LAMP HOUSING CAST INTEGRAL WITH FACE RING.

The principal object of this new design is to place in a centralized position the two air gages and the indicating hands of same as near together as possible, so that the engineer by concentrating his vision particularly on the brake pipe and equalizing reservoir hands may regulate more uniformly and accurately his brake applications and secure smooth handling of the train.

ASHTON NO. QI-9 QUADRUPLEX ILLUMINATED LOCOMOTIVE STOKER GAGE

The Ashton Locomotive Stoker Gage is a combination of two duplex gages, ordinarily used in stoker service, mounted in heavy rectangular dust-proof case.

Combining the two gages in one case reduces the space required for this equipment in locomotive cabs. Especially adapted to service on the HT and HT-I stokers or other types where three or four pressure indications are required.

THE ASHTON VALVE COMPANY

161-179 FIRST STREET, CAMBRIDGE, MASS.

CHICAGO, ILL. NEW YORK, N. Y. SAN FRANCISCO, CAL.

Swanson Flange Oiler Installed on Diesel Switching Locomotive

SWANSON
FLANGE OILER

NEW IMPROVED DESIGN 100% AUTOMATIC

WILL SAVE TONS OF STEEL ON TIRES AND RAILS—REDUCE THE NUMBER OF DERAILMENTS

The Valve opens when the engine is in motion and automatically closes when the engine is at rest. The shoe wipes the oil on the flange and prevents spreading on tread of wheel.

Thousands of Swanson Oilers in use on over 70 Roads.

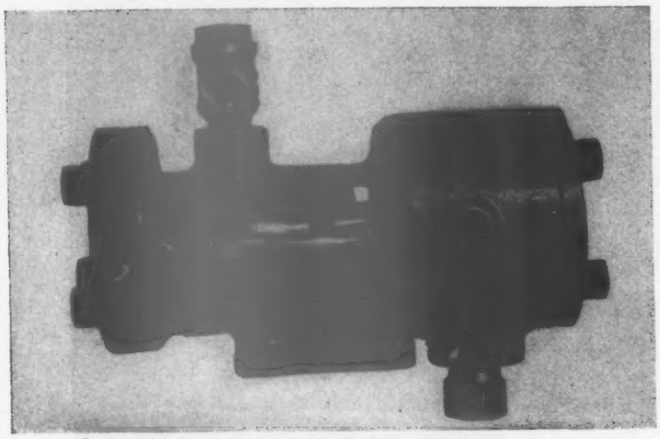
We manufacture Flange Oilers suitable for all types of Steam and Diesel Locomotives.

Write Today for Full Particulars

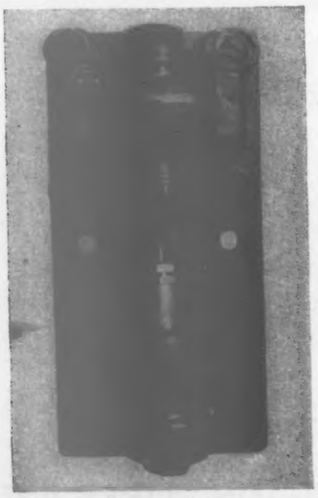
The SWANSON COMPANY

1644 Farragut Ave. **Chicago 40, Ill.**

Maximum Protection for Locomotive Cylinders



Control Valve located on bracket near balancing valve.



Balancing By-Pass Valve, located on steam chest.

Auxiliary Throttle located at the dome.

Ardco Automatic Air-Operated Cylinder Cock.

THE modern locomotive with its one-piece bed represents a huge investment which must be protected against failures and long, expensive tie-ups for repairs.

No components are more vital than the cylinders. Application of ARDCO Automatic Drifting Equipment will play a big part in the prevention of failures and those maintenance items which greatly affect availability. By the automatic admission of a limited amount of steam during periods when the locomotive is drifting, normal lubrication is maintained and all wearing parts in the valves and cylinders are protected against the destructive results of hot corrosive gases and abrasive cinders which are drawn in from the smoke-box under ordinary conditions.

Performance reports of locomotives equipped with ARDCO Drifting Equipment show a big savings in valve and cylinder maintenance. Application is simple and does not require any change in the design.

ARDCO AUTOMATIC CYLINDER COCKS—will protect against damaged cylinders, bent piston rods, breakage of cylinder packing and other expensive repair items caused by trapped water or steam in the clearance spaces. They open automatically when the pressure in the cylinders exceeds boiler pressure. They operate by air pressure and will remain open automatically when the engine is in the enginehouse or on storage tracks.

We at ARDCO are proud to be doing our utmost for our armed forces. Recognition of this responsibility and the excellence of ARDCO production is evidenced by the triple "E" flag which proudly flies over our plant.

Ardco Manufacturing Co.

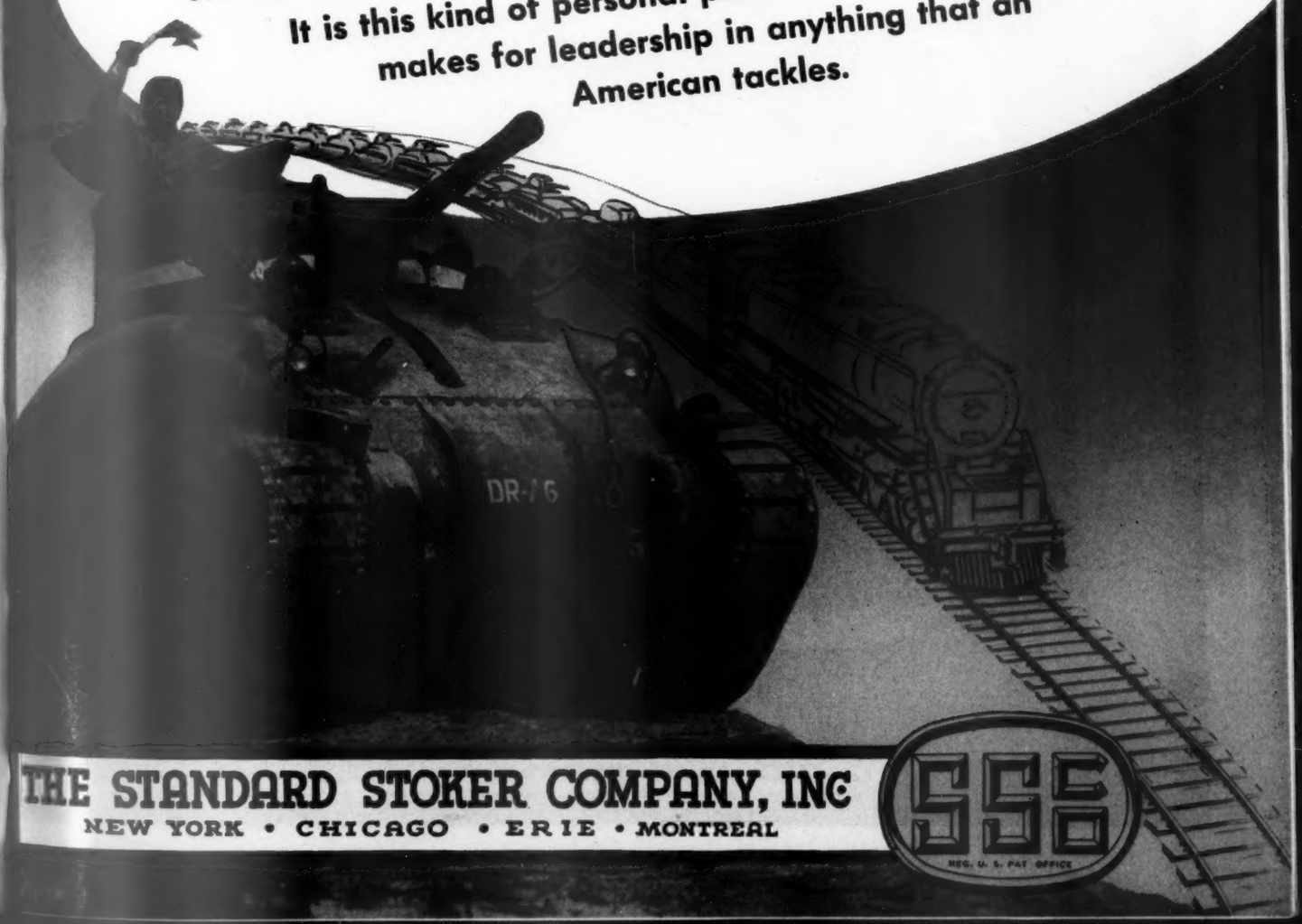
North Bergen, New Jersey

Ardco Automatic Drifting Equipment Automatic Cylinder Cocks

"STANDARD STOKERS"

The tank crew sees in its tank the best tank in the outfit.
The engine crew sees in its locomotive the best locomotive on the road.
We of Standard Stoker, who have built more than 16,500 Standard Stokers, see in our stokers the best locomotive stokers in the world.

It is this kind of personal pride in achievement that makes for leadership in anything that an American tackles.



THE STANDARD STOKER COMPANY, INC
NEW YORK • CHICAGO • ERIE • MONTREAL

SSS
REG. U. S. PAT. OFFICE

For Safety, Economy and
UNION PACIFIC
3967
3113

with High Availability . . .

HOLLOW STAYBOLTS

FLANNERY BOLT COMPANY

BRIDGEVILLE ★ PENNSYLVANIA

It's Not What You Make—

But What You Receive.

THE C-S SUPERHEATER

Deducts The Minimum

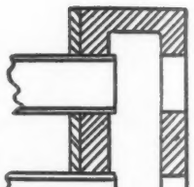
Section through flue

PRESSURE DROP through superheater equipment is a deduction made against effective boiler pressure at the cylinders.

Like payroll deductions, pressure drop is necessary—but should be no more than is required for adequate protection of the units.

The C-S Superheater is designed for a maximum deduction of only ten pounds—from dry pipe to cylinders.

Over a third of a million miles of service has proved this to be both safe and economical. Why deduct more?

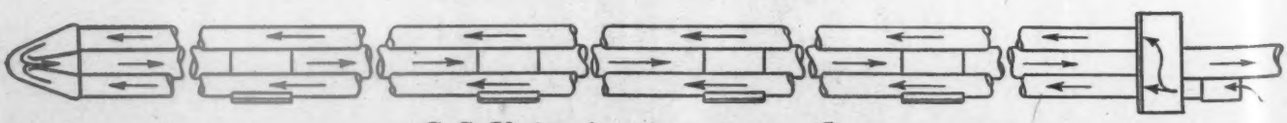


Section through front manifold

For details send for a copy of Bulletin C-SI

THE J. S. COFFIN, JR., COMPANY

ENGLEWOOD, NEW JERSEY



C-S Unit showing steam flow

APEXIOR SURFACING MATERIALS FOR INTERIORS OF LOCOMOTIVE BOILERS AND TENDER TANKS...

APEXIOR REG. U.S. PAT. OFF.

Fig. 1 — One half of this piece of standard locomotive flue has been surfaced with APEXIOR NUMBER 1.

APEXIOR NUMBER 1 is a brush-applied surfacing material for the water side of locomotive boiler flues, shells, firebox sheets and staybolts. The coating of APEXIOR protects against corrosion by filling and covering the surface of the metal to an average thickness of 0.0025 inch. Water contact with the metal and penetration of the metal structure is prevented. The character of the APEXIORIZED surface is such that dirt and scale do not bond as tightly as to bare steel. Boiler washing is more effective. Long operation of APEXIOR on heating surfaces at all pressures and ratings and in all types of boiler equipment has indicated no effect to retard heat transmission.

APEXIOR NUMBER 1 is not a substitute for feed-water preparation or chemical treatment. It supplies protection for metal in service under boiler water and steam temperatures and pressures, supplementing the work of the chemist and water service engineer by increasing the durability and raising the service quality of the boiler metal. It is the simplest and most effective kind of Mechanical cooperation with the Water Service Department.

It has been demonstrated on a number of railroads that APEXIOR surfaced metal means longer life of flue and sheet steel under boiler water, lower average maintenance costs and easier and more effective boiler washing.

Fig. 1 shows a piece of standard flue partially surfaced with APEXIOR or APEXIORIZED. The entire tube was passed through a sandblasting machine before the application. Sand-blast cleaning is not essential. It is, however, considered to be the most satisfactory cleaning method. Any steel surface that is dry and free from loose rust, scale, dirt or oil will bond properly with APEXIOR for longer and better service.

Badly pitted flues which were on the road to the scrap pile have been reclaimed, surfaced with APEXIOR and placed in active equipment.

Fig. 2 shows an area of APEXIOR surfaced boiler plate and rivet heads after two years' service at 215 pounds operating pressure. Observe that no metal is exposed. The protective surfacing has remained intact.

Service experience of five years on locomotive shells is now available. It has been fully demonstrated on several important Systems that APEXIOR is effective in railroad locomotive boilers to retard or check corrosion and pitting, and that any subsequent use of chipping hammers, air scaling tools or sandblast cleaning of shells after flues are removed, may be dispensed with. APEXIOR surfacing of staybolts and of other water contact areas subjected to the hazard of embrittlement or accelerated stress corrosion, may have interesting possibilities. It is the kind of modernization that assists any steam power unit to maintain its position against competitive types of power equipment.

APEXIOR NUMBER 3 is a protective surfacing material for the interior of general tank and tender equipment. It is brush-applied cold and dries a smooth, shiny jet black.

APEXIOR surfacing materials are well-known and have a wide distribution in stationary utility, railroad and general industrial power plants throughout the country, and in the marine field. Shipped ready to apply after mixing in the container.

APEXIOR REG. U.S. PAT. OFF.

Fig. 2 — APEXIOR surfaced boiler plate and rivet heads after two years service under 215 pounds boiler operating pressure. Note brush marks and thickness of film over plate markings.

THE DAMPNEY COMPANY OF AMERICA

HYDE PARK · BOSTON · MASSACHUSETTS

ATLANTA NEW YORK PHILADELPHIA CHICAGO DETROIT

DURAMETALLIC Expansion Joint Packing

CROSS SECTION OF
DURAMETALLIC STLYE D-114

Shopping to Shopping Service on Saturated and Superheated Steam

FOR LONG UNINTERRUPTED SERVICE on locomotive expansion joints — specify Durametallic . . . an anti-frictional, flexible metallic packing with resilient core that insures a free working joint.

WRITE FOR ILLUSTRATED BULLETIN AND PRICES

DURAMETALLIC EXPANSION
JOINT PACKING — STYLE D-110

The PERFECT SEAL

DURAMETALLIC CORPORATION

KALAMAZOO MICHIGAN

Manufacturers of PACKINGS for — AIR PUMPS • STOKERS • EXPANSION JOINTS • CAB COCKS
WATER GAGE GLASS • FEED WATER PUMPS • VALVE STEMS • REVERSE GEARS AND DURA HOOK PACKING PULLERS

Many railway executives have found that workers themselves prefer Willson safety devices . . . wear them willingly . . . report them unusually comfortable.

This is due to the fact that Willson goggles and respirators are not made to fit any ONE face, but are so designed that, with slight adjustment, they will comfortably fit ANY of the facial types in the vast "melting pot" of American industry.

Because ALL Willson protection is scientifically engineered to yield the utmost in safety and comfort, it is given the "green light" by many railroad operating and safety officials.

WILLSON WELDING GOGGLES
WAW10
Black composition cups, heat and moisture proof, are anatomically correct in shape. Indirect ventilating ports shut out dangerous sparks and light rays.

GOGGLES • GAS MASKS
RESPIRATORS • HELMETS

DOUBLE WILLSON
PRODUCTS INCORPORATED
READING, PA. U.S.A.

RIVET FORGES
Equipped with Johnston Non-Clogging Vacuum Type Oil Burners.
HEATING TORCHES
FIRE LIGHTERS
TIRE HEATERS
OIL BURNERS
PRESSURE BLOWERS

JOHNSTON
MANUFACTURING COMPANY
MINNEAPOLIS, MINNESOTA

GALE LOCOMOTIVE DRAFTER

Compressed Air Operated

A Real Money Saver For Railroads

- Light and convenient to handle
- Serves grate areas up to 120 sq. ft., and smoke stacks 16½ to 28 inches
- Economical in air consumption
- No maintenance expense
- Quiet and efficient in operation
- Portable and flexible in application
- Refrigerating feature enables handling with bare hands on removal from smoke stack
- Equipped with special Ingersoll-Rand Air Motor

MADE IN TWO SIZES
Weight: Small size 18 lbs.—Large size 24 lbs.

Patent No. 2,225,412

Used on leading railroads in the United States and War Dept. Railway Battalions, who are drafting their locomotives quickly and cheaply through the use of this unit.

NATIONAL BOILER WASHING SYSTEMS

80 East Jackson Blvd., Chicago 4, Illinois

BUCKEYE

6 and 8 wheel *Tender Trucks*

Ⓑ

Freight and Passenger . . in all sections of the country have demonstrated

OPERATING ECONOMIES

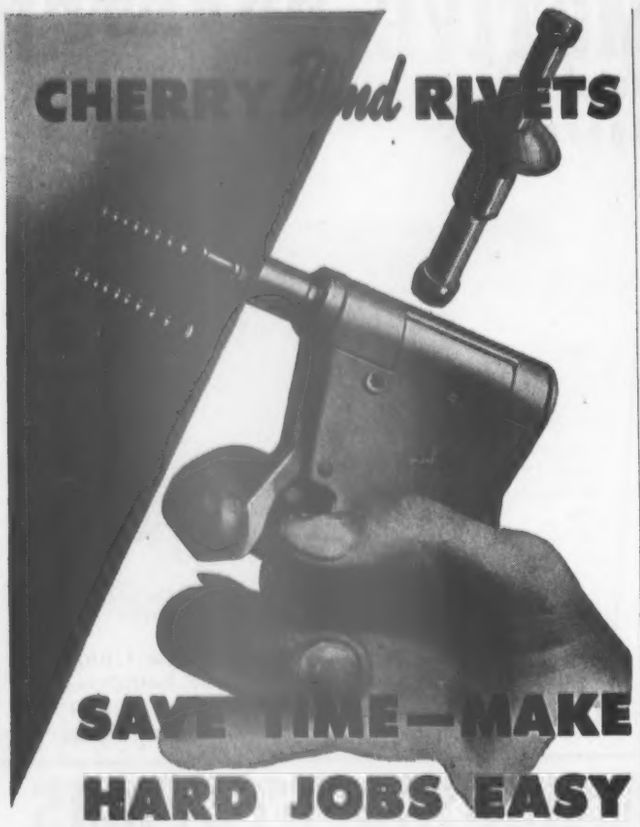
due to

Reduced Weight . . . Fewer Wearing Parts . . . Positive Equalization

THE BUCKEYE STEEL CASTINGS COMPANY

Manufacturers of Couplers, Truck Frames and Bolsters, Draft Attachments and Tender Trucks

NEW YORK COLUMBUS, OHIO CHICAGO



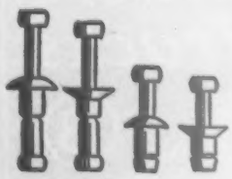
CHERRY Blind RIVETS

SAVE TIME—MAKE HARD JOBS EASY

The Cherry Rivet is a mechanical blind rivet made of aluminum alloy. It is applied by one man using a power or hand-operated gun. No bucking bar is required.

Its positive mechanical action gives it high shear and fatigue values which have been proved under the severe vibration and stress conditions encountered in combat aircraft.

There are undoubtedly many places in your business where Cherry Blind Rivets can be used to speed production and reduce manufacturing costs. Before completing your plans for any new products or manufacturing methods, investigate this new but proved way of riveting.



From left to right... the self-plugging type with brazier and countersunk heads... the hollow type with both styles of heads.

WRITE FOR HANDBOOK. Get the complete story on Cherry Rivets in Handbook A-43. Address Dept. A-277, Cherry Rivet Company, 231 Winston Street, Los Angeles 13, Calif.

Cherry Rivets, their manufacture and application are covered by U. S. patents issued and pending

Cherry Rivet
Company
LOS ANGELES, CALIFORNIA

ADECO

NOZZLE TESTER

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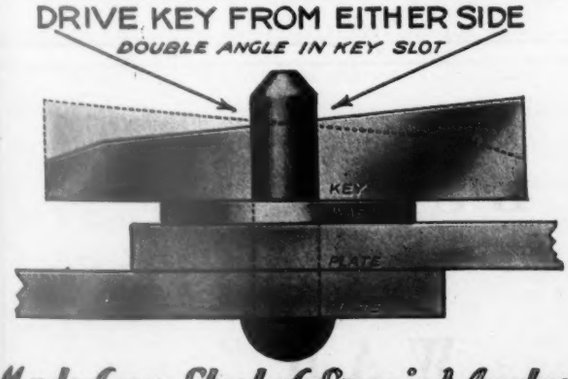

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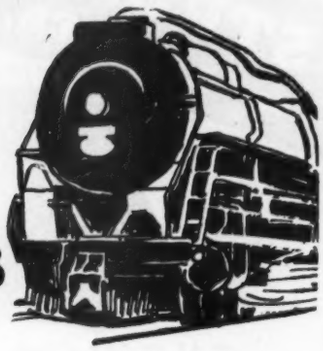

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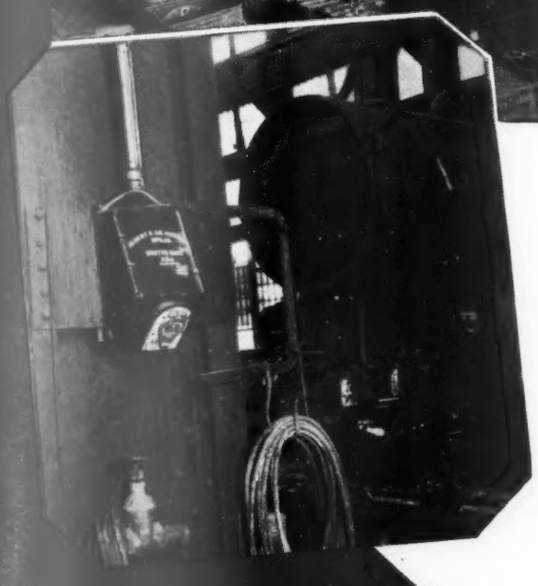

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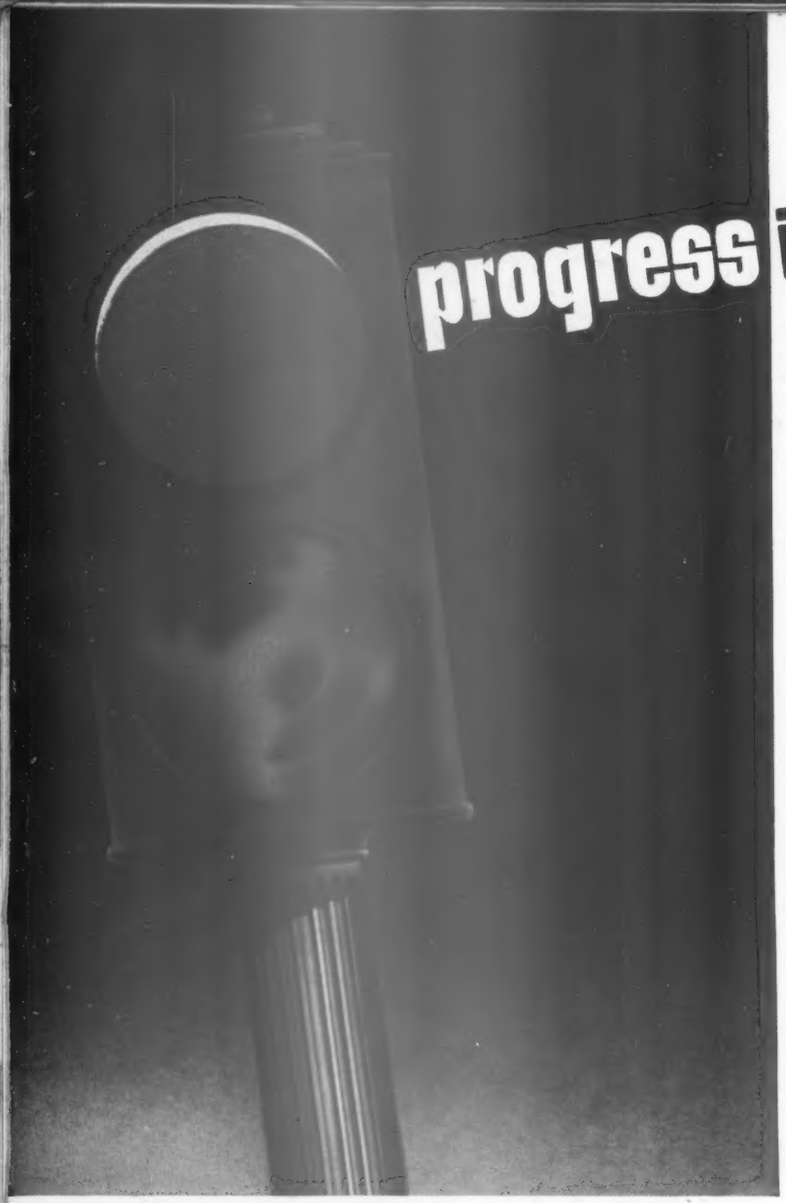

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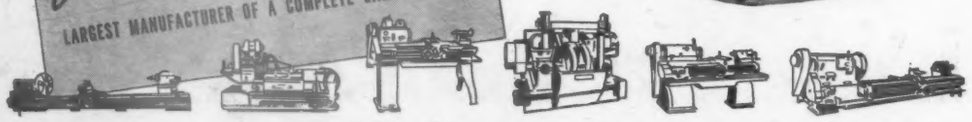

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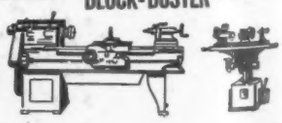

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